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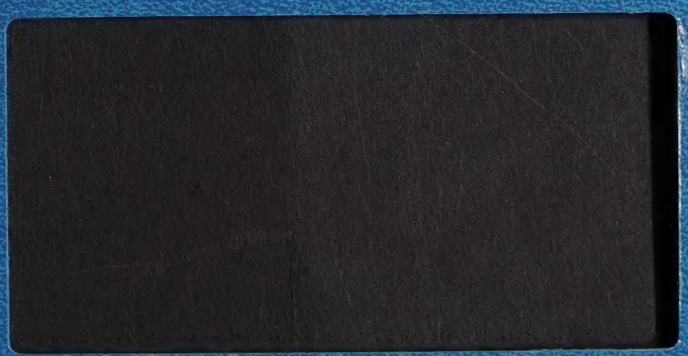

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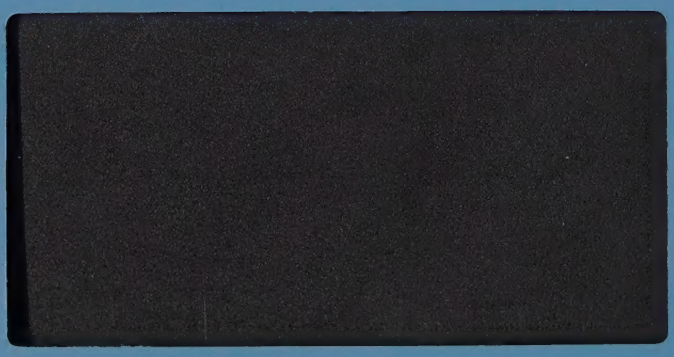

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834
PROGRAMMABLE DATA COMMUNICATIONS TESTER WITH OPTIONS

OPERATORS

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

070-3400-01
Product Group 35

Serial Number _____

First Printing AUG 1980
Revised JUL 1983

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

Terms In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

Terms As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

Symbols In This Manual

This symbol indicates where applicable cautionary or other information is to be found.

Symbols As Marked on Equipment

DANGER — High voltage.

Protective ground (earth) terminal.

ATTENTION — refer to manual.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

For detailed information on power cords and connectors, see maintenance section.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse of correct type, voltage rating and current rating as specified in the parts list for your product.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

The 834 Programmable Data Communications Tester.

GENERAL INFORMATION

INTRODUCTION

Description

The 834 Data Communications Tester is a portable instrument for monitoring, analyzing, testing, and troubleshooting data communications interfaces that conform to EIA Standard RS-232 or C.C.I.T.T. V.24. An optional accessory allows testing of 20- and 60-milliamp current loop interfaces.

The 834 can operate as:

- A serial data transmission monitor.
- A Data Communications Equipment (DCE, modem) simulator for testing terminals off-line.
- A Data Terminal Equipment (DTE) simulator for testing DCE.
- A Bit and Block Error Rate Tester (BERT).

The 834 offers 16 baud rate settings ranging from 50 to 19200, buffer storage capacity of 2699 characters, a 16-character alphanumeric display, and a user-oriented keyboard. Users can configure and execute multi-step tests and view the results in seconds.

An Interface Access Panel on the front panel of the 834 allows the user to reconfigure interface lines and access.

Plug-in, external ROM Packs are available for the 834. Each ROM pack customizes and expands operation of the 834 for specific uses. Each ROM Pack will have at least one socket suitable for insertion of a user-defined ROM.

The 834 contains self-test routines to verify proper operation. Diagnostic tests are available in a ROM Pack to provide service technicians with a means to rapidly troubleshoot and repair the instrument.

The 834 front panel cover and bottom compartment provide storage for all standard accessories.

User ROM Packs

Plug-in, external ROM Packs are available for the 834. Each Rom Pack expands operation of the 834 for specific uses (Asynchronous Systems, Bisynchronous Systems, Link Testing, etc.). Each ROM Pack has at least one socket available for insertion of a user-defined ROM.

ROM Packs provide the 834 with expanded capabilities and "canned" routines. These routines free the user from repeatedly entering frequently used routines via the keyboard. Users can customize an 834 to virtually any test situation by encoding a ROM with their own routines and inserting the ROM in the socket provided.

Refer to the documentation provided with each ROM Pack for specific details. Section 3 of this manual contains information on manual ROM coding.

Modes of Operation

The 834 has five modes of operation:

Monitor
DCE Simulator
DTE Simulator
BERT
Self-Test

Serial Data Transmission Monitor

When connected as shown in Figure 1-1, the 834 monitors and records the activity of an interface without interfering with the interface. Acquired data can be selectively recalled and displayed on the alphanumeric readout along with the corresponding control line status indicators.

Modem (DCE) Simulator

When connected as in Figure 1-2, the 834 performs as a DCE or modem simulator for testing a DTE. Messages can be sent to the DTE and received messages can be examined for trigger events which can cause further action by the 834. How the 834 responds to the received data is determined by a program entered from the keyboard.

Terminal (DTE) Simulator

When connected as shown in Figure 1-3, the 834 performs as a DTE simulator. Operation is similar to the DCE Simulate mode described above.

BERT

When connected as shown in Figure 1-3, the 834 can perform Bit and Block Error Rate Tests (BERT) for testing data communications links. The 834 uses the 511 bit C.C.I.T.T. standard pseudo-random pattern.

Self-Test

The user can achieve a high level of confidence in the 834's operation by using the routines selected in the Self-Test menu. Displays generated indicate successful or unsuccessful completion of the tests.

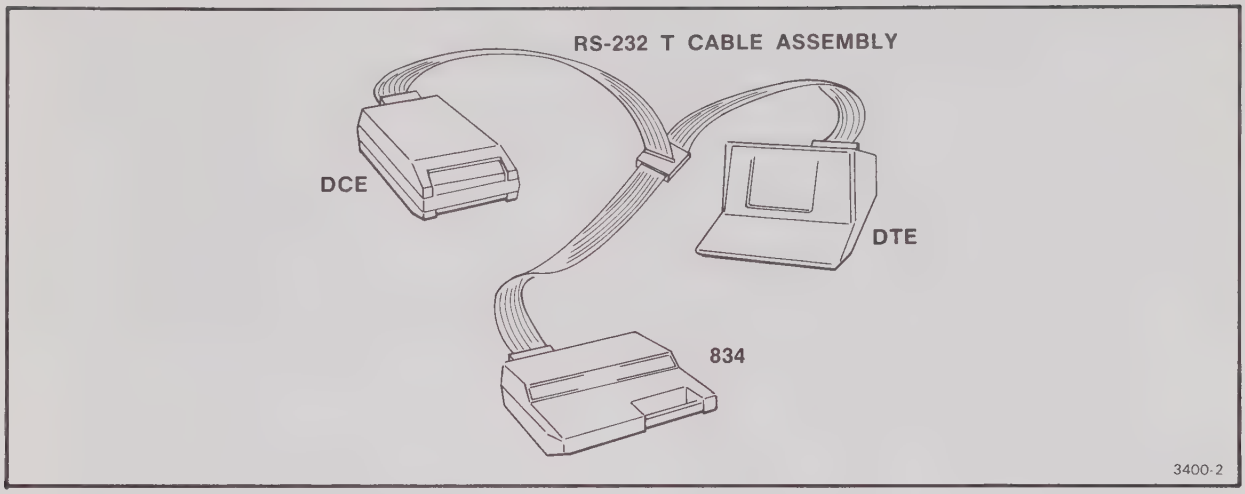


Figure 1-1. The 834 Connected for Use in Monitor Mode.

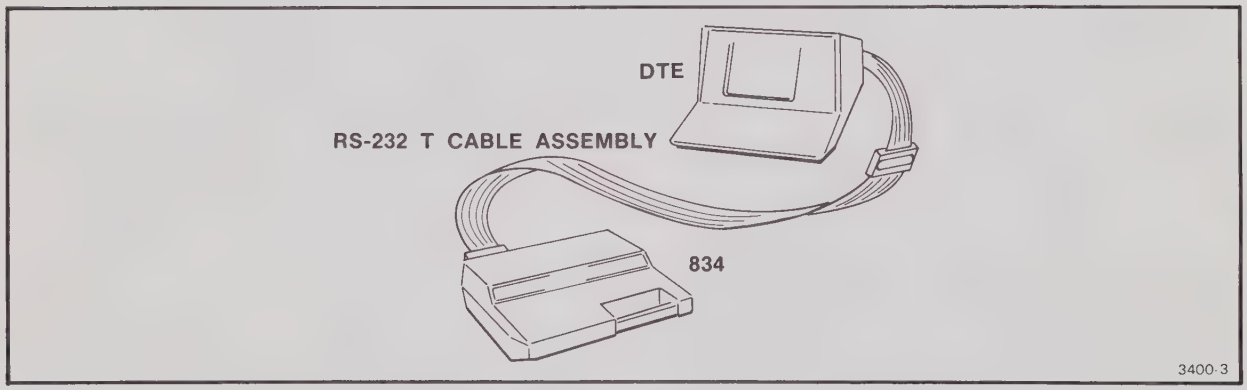


Figure 1-2. The 834 Connected for Use in DCE Simulate Mode.

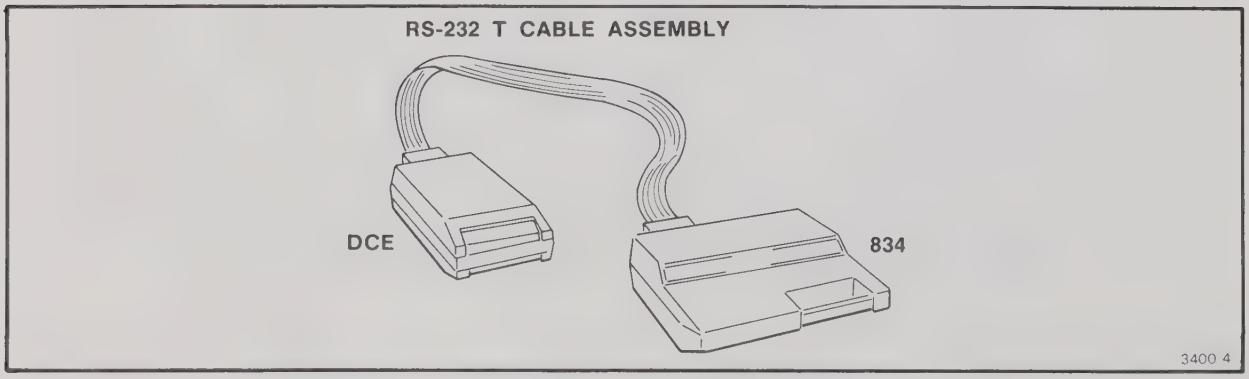


Figure 1-3. The 834 Connected for Use in DTE Simulate Mode.

SPECIFICATION

INTRODUCTION

Tables 2-1 through 2-4 list the electrical, environmental and physical characteristics of the instrument. The electrical characteristics are valid under these conditions: (1) the instrument has been adjusted as described in Calibration and Performance Verification (see Service Information of 834 Instruction Manual) at an ambient temperature between +20 and +30 degrees Centigrate (+68 to +86 degrees Fahrenheit); (2) the instrument is operating in an ambient temperature between 0 and +50 degrees Centigrade (+32 to +122 degrees Fahrenheit) and (3) the instrument has warmed up for at least five minutes.

Table 2-1
FUNCTIONAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
Data Transfer Rates	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600 and 192000* bit/second. *In syncronous set up (SYNC), FDX data transfer rates are limited to a maximum of 9600 baud ASYNC and HDLC setups will operate FDX at 19.2 k baud.	9600 bits/second maximum rate when Current Loop Adapter is used.
Accuracy (internal crystal control)		
SYNCHRONOUS & HDLC setups	Within 0.02%.	
ASYNCHRONOUS setup	Within 0.1%.	
Code	ASCII, EBCDIC, HEX, and other user-defined codes specified in User ROM (optional).	The user-defined code must use the same character font.
Communications Mode	Half- or full-duplex.	
RTS/CTS Delay (half-duplex mode only)	Programmable from 0 to 9999 milliseconds. Power-up default is 200 ms.	
Accuracy	+5. −15 ms.	
ASYNCHRONOUS SETUP		
Bit/Character	5, 6, 7, 8, or 9.	Includes parity bit, if parity is active. 5 bits/character cannot be run with parity. ODD or EVEN parity is required with 9 bits/character.
Parity	None, odd, even, parity bit always mark, parity bit always space.	
Stop Bits	1, 1.5, 2.	
End of Frame	One programmable character (any bit combination).	Includes parity bit, if parity is active.
Timing	Normal asynchronous, or isochronous (uses 1X clock from RS-232 interface).	

Table 2-1 (Cont.)

Characteristic	Performance Requirement	Supplemental Information
SYNCHRONOUS SET-UP		
Bits/Character	5, 6, 7, or 8.	
Parity	None, odd, even, parity bit always mark, parity bit always space.	5 bits character cannot be run with parity.
Block Check Code	CRC-16 or LRC.	
Syncronizing Character (SYN)		
8 Bits/Char	Programmable to require any 1 or 2 characters (if 2, they may be different). Power-up default is 2 EBCDIC SYN characters (hex 32).	
7, 6, 5 Bits/Char	2 SYN characters must be programmed. The 834 will search for an 8-bit SYN pattern made up of the last 8 bits of this 2-character sequence.	
End of Frame	One programmable character (any bit combination).	
Idle Line	4 All mark, all space, or SYN characters. 8 ALL mark, all space, or SYN characters. 8 All mark characters. 8 All space characters. or 8 SYN characters.	
Clock	Normal (supplied by DCE/DTE). Derived from received data transitions), or DTE (T-Data clock supplied by DTE device).	
HDLC SETUP	Automatically sets up: 8 bits/character No parity CRC = CCITT SYN = Flag character (hex 7E) End of Frame defined by flag character (hex 7E). Flag characters are not stored or displayed. Idle line (flags or all 1's) between frames is not stored or displayed. Can receive frames with Combined Close/Open falgs or Zero-Bit Common to Continuous flags.	
Clock	Normal (supplied by DCE/DTE). Drived (from received data transitions), or DTE (T-Data clock supplied by DTE device).	

Table 2-1 (Cont.)

Characteristic	Performance Requirement	Supplemental Information
NRZI	On or off.	
BLOCK ASYNCHRONOUS SETUP		
Bits/Character	5, 6, 7, 8, or 9.	Includes parity bit, if parity is active. 5 bits/character cannot be run with parity. ODD or EVEN parity is required with 9 bits/character.
Parity	None, odd, even, bit always mark, bit always space.	
Stop Bits	1, 1.5, 2.	
End of Frame	One programmable character (any bit combination).	
Timing	Normal asynchronous or isochronous (uses 1X clock from interface).	
Block Check Code	CRC=16, LRC.	Must be accessed from Synchronous setup.
Idle Line	4 All mark, all space, or SYN characters. 8 All mark, all space or SYN characters. 8 All mark characters. 8 All space characters. or 8 SYN characters.	Must be accessed from Synchronous setup.

Table 2-1 (Cont.)
FUNCTIONAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
MONITOR MODE		
Trigger Parameters		
Location	Start. Center. End.	
Match	Source of Data being searched for trigger events: None, DTE, DCE.	
Trigger Events	May be a combination of trigger character sequence, an error, or a marker transition; whichever occurs first.	
Trigger Sequence	Programmable to require a sequence of 0-5 characters. (0-25 characters if a mask is set.)	
Mask Sequence	Programmable to mask a 0- to 25 character trigger sequence.	
Error		
In Async In Sync In HDLC	A parity or framing error. A parity error. A CRC error or an abort sequence.	
Marker	Low-to-high or high-to-low transition of marker input can be selected.	
Data Captured		
When no trigger event is specified.		
Start (Position)	First 2699 characters of DTE and DCE data received after START is pressed.	
Center, End	Last 2699 characters received before STOP is pressed.	
When trigger event is specified		
Start (Position)	Up to 32 characters received before (and including) the first trigger event and following characters up to a total of 2699 characters.	
Center	Up to 1351 characters received before (and including) the first trigger event, and following characters up to a total of 2699 characters.	
End	Up to 32 characters received after the first trigger event and previous characters up to a total of 2699 characters.	

Table 2-1 (Cont.)
FUNCTIONAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
SIMULATE MODES		
Program Steps	99 steps available.	
Messages	50 messages can be programmed. 3000 bytes available. Message length limited only by how many bytes of unused message programming space remain available.	
Parameters	50 parameters can be programmed. Programmable from 10 to 9,999 milliseconds.	Resolution of 10 ms.
Accuracy	+5, -15 ms.	
Data Captured	Always the last 2699 characters received before the program stops or before STOP is pressed.	
BERT/BLERT MODE		
Data Transfer Rates	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 19200 bits/second.	
Total Bits Received (per test)	10^5, 10^6, or continuous.	
Data Transmission Timing	Synchronous and Asynchronous.	
Bits/Character (Async timing)	5, 6, 7, 8, or 9.	
Parity (Async timing)	None, odd, even, parity bit always mark, parity bit always space.	
Stop Bits (Async timing)	1, 1.5, 2.	
Clock (Sync timing)	Normal Derived, DTE.	
Data Pattern	Pseudo-random 511 bits (CCITT standard).	
Block Length	1000 bits.	
Data		
Bit Errors	Count 0-9999	
Block Errors	Count 0-9999	
Blocks Rec'd	Count 0-9999	
Faults	Count 0-9999	

Table 2-2
ELECTRICAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
INTERFACE CONNECTOR (J316), MONITOR MODE		
Inputs Pin 2 Transmitted data 3 Received data 4 Request to send 5 Clear to send 6 Data set ready 8 Data carrier detect 15 Transmission signal element timing (DCE source) 17 Received signal element timing (DCE source) 20 Data terminal ready 24 Transmit signal element timing (DTE source)		MARK or OFF -25 V ≤ Vin ≤ 0 V. SPACE or ON: +2.2 V ≤ Vin ≤ +25 V Input Impedance Zin ≥ 7.5 kΩ
Outputs None		
Other Pin 1 Ground 7 Signal Ground 9-14, 16, 18, 19, 21-23, 25		 Connected to the instrument ground. Connected only to pins on the Interface Access Panel.
INTERFACE CONNECTOR (J316), DCE SIMULATE MODE		
Inputs Pin 2 Transmitted data 4 Request to send 20 Data terminal ready 24 Transmit signal element timing (DTE source)		 MARK or OFF: -25 V≤ Vin ≤0 V. SPACE or ON: +2.2 V ≤Vin ≤+25 V. Input impedance Zin ≥7.5 K ohms.
Outputs Pin 3 Received data 5 Clear to send 6 Data set ready 8 Data carrier detect		 MARK or OFF: Vout ≤ -7 V. SPACE or ON: Vout ≥ +7 V. With load impedance: R_L ≥3 K ohms.

Table 2-2 (Cont.)

ELECTRICAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
15 Transmission signal element timing (DCE source) 17 Receiver signal element timing (DCE source)		
Other Pin 1 Chassis ground 7 Signal ground 9-14, 16, 18, 19, 21-23, 25		 Connected to the instrument ground Connected only to pins on the Interface Access Panel.

INTERFACE CONNECTOR (J316), DTE SIMULATE AND BERT MODES

Inputs Pin 3 Received data 5 Clear to send 6 Data set ready 8 Data carrier detect 15 Transmission signal element timing (DCE source) 17 Receiver signal element timing (DCE source)		 MARK or OFF: -25 V ≤ Vin ≤0 V. SPACE or ON: +2.2 V ≤ Vin ≤ +25 V. Input impedance: Zin ≥ 7.5 K ohms.
Outputs Pin 2 Transmitted data 4 Request to send 20 Data terminal ready 24 Transmit signal element timing (DTE source)		 MARK or OFF: Vout ≤ -7 V. SPACE or ON: Vout ≥ +7 V. With load impedance: R_L ≥3 K ohms.
Other Pin 1 Ground 7 Signal ground 9-14, 16, 18, 19, 21-23, 25		 Connected to the instrument ground. Connected only to pins on the Interface Access Panel.

INTERFACE ACCESS PANEL

Probe + – Input Impedance		 +3 V ≤ Vin ≤ +25 V. -25 V ≤ Vin ≤ -3 V. ≥ 50 K ohms.

Table 2-2 (Cont.)
ELECTRICAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
Marker		SPACE or ON: +2 V ≤ Vin ≤ +25 V. MARK or OFF: -25 V≤ Vin ≤ +0.6 V.
+ Volt Source		+12 V ±1 V (no load).
Output Impedance		Approximately 3 K ohms (each pin).
− Volt Source		-12 V ±1 V (no load).
Output Impedance		Approximately 3 K ohms (each pin).

POWER REQUIREMENTS

Line Voltage Ranges		
115 V 230 V	90 to 132 V. 180 to 250 V.	
Line Frequency Range	48 to 440 Hz.	
Power Consumption	Approximately 30 watts.	

Table 2-3

ENVIRONMENTAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
Temperature		Environmental Specifications are considered to be valid over a long period of time; therefore, performance verification is not required.
Operating	0° to +50°C (+32° to +122°F).	
Non-operating	-40° to +75° C (-40° to +167° F).	
Humidity	5 cycles (120 hours), 30° to 60° C, 95% relative humidity.	
Altitude		
Operating	To 15,000 feet (4,500 m).	
Non-operating	To 50,000 feet (15,000 m).	
Vibration	Cycle the vibration frequency from 10 to 55 to 10 Hz (linear or logarithmic sweep) for a duration of 15 minutes in each major axis at a displacement of 0.025 inches (0.64 mm) peak-to-peak. Dwell for 10 minutes in each major axis at any resonant frequency.	
Shock	50 Gs, 1/2 sine, 11 ms duration, 3 shocks in each major axis for a total of 18 shocks.	

Table 2-4

PHYSICAL SPECIFICATIONS

Characteristic	Description
Overall Dimensions (see Figure 2-1)	
Length	12.4 inches (306 mm).
Width	12.1 inches (305 mm).
Height	4.0 inches (102 mm).
Weight	Not more than 13 pounds (5.9 kg).

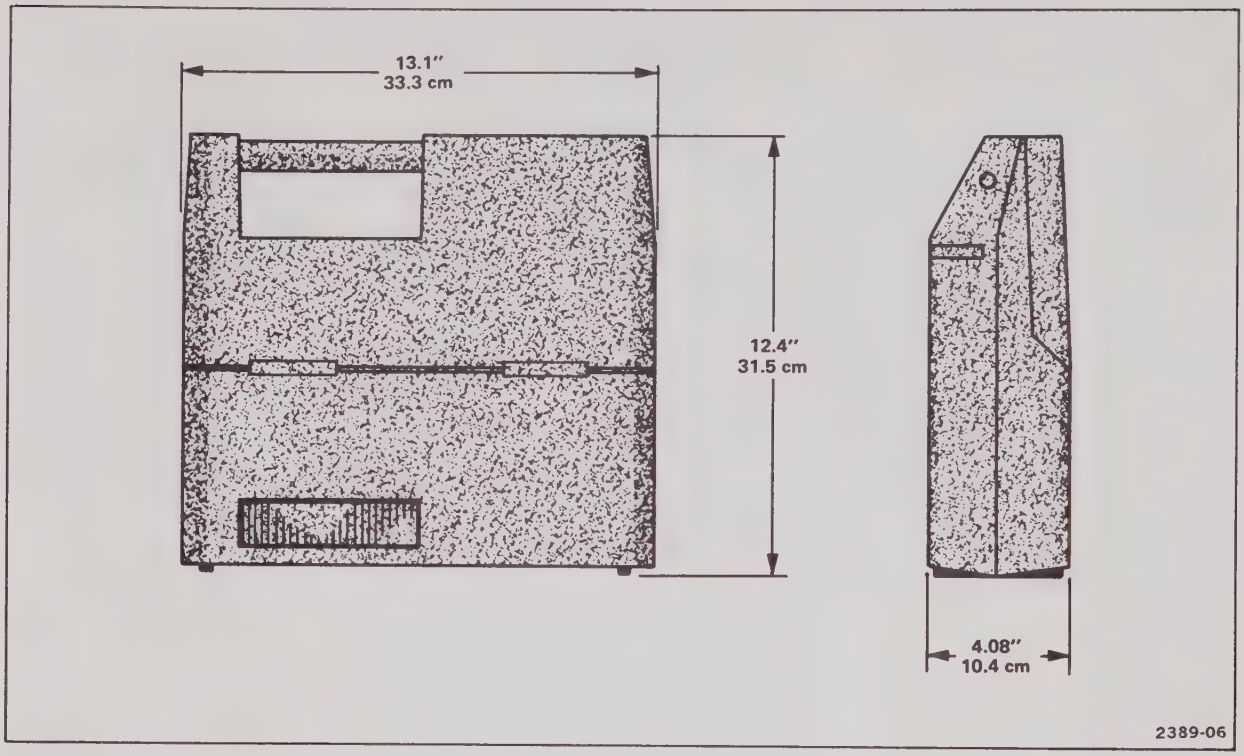


Figure 2-1. Dimensional Drawing.

STANDARD ACCESSORIES

Items:	1 EIA Cable	Tektronix Part No.:	175-7176-00
	1 Line cord		161-0066-00
	1 Jumper Set		198-4006-00
	1 User's Guide		070-3628-00
	1 Operator's Manual		070-3400-01

OPTIONAL ACCESSORIES

Items:	1 Diagnostic ROM Pack	Tektronix Part No.:	067-0986-00
	1 Empty ROM Pack		020-0607-00
	1 834 Carrying Case		016-0672-00
	1 Shielded EIA Cable		175-3305-00
	1 Current Loop Interface Ad		015-0361-00
	1 Instruction Service Manual		070-3399-00

OPERATING INSTRUCTIONS

INTRODUCTION

Installation

Installation consists of checking the selected operating voltage and connecting the 834 to a power source and an interface.

Power Requirements

The 834 operates from a nominal single-phase power source of 115 or 230 V, 48 to 440 Hz. Before connecting the 834 to a power source, verify that the line voltage indicator is showing the correct voltage for the source to be used (refer to Figure 3-1).

CAUTION

If the line voltage indicator shows the wrong voltage for the power source to be used, refer the instrument to qualified service personnel.

Power Cord

The 834 has a 3-wire power cord with a 3-contact plug for connection to the power source and to protective ground. To avoid electrical shock, plug the power cord into a properly wired receptacle before making any connections to the instrument.

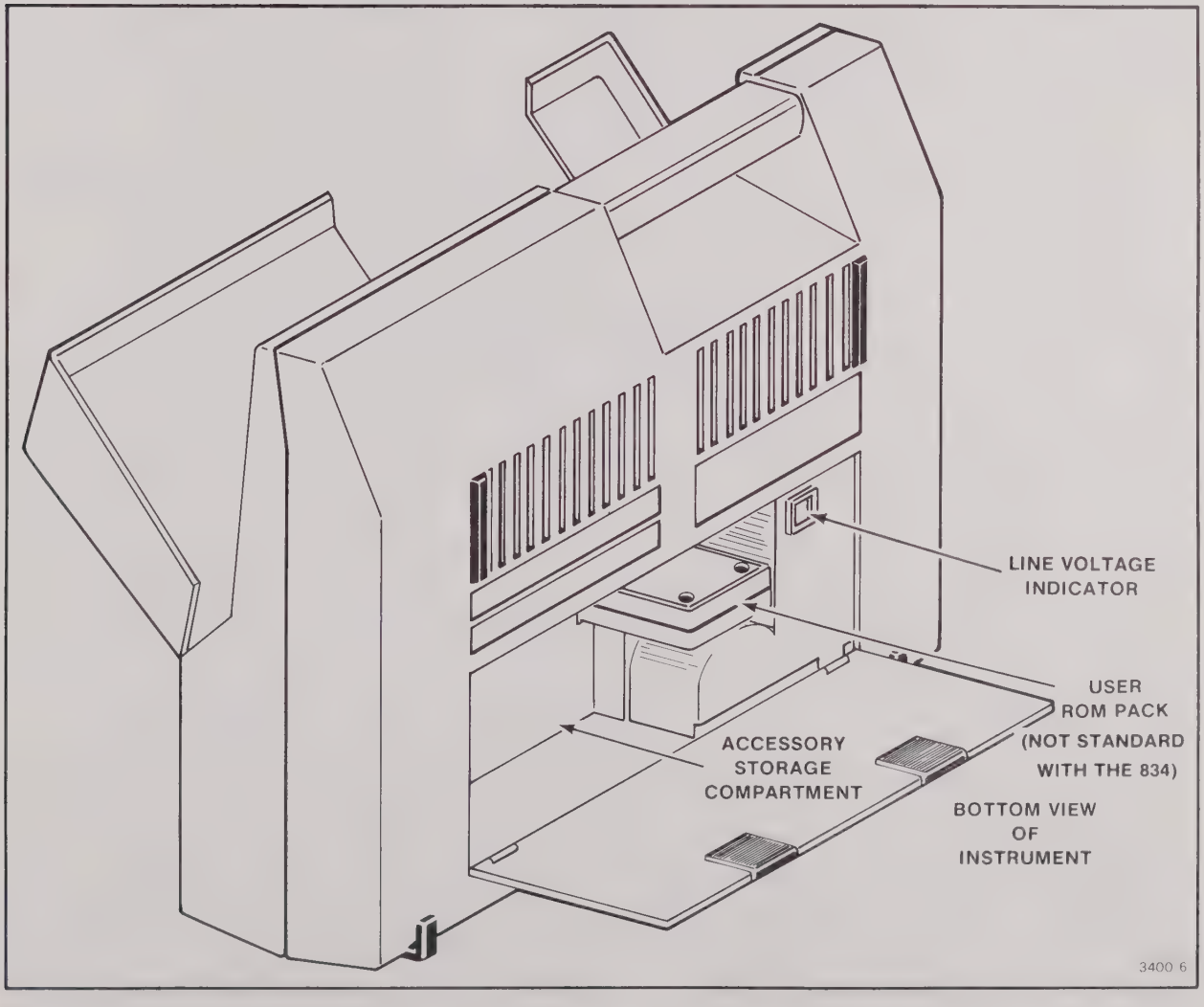

LINE VOLTAGE INDICATOR
USER ROM PACK (NOT STANDARD WITH THE 834)
ACCESSORY STORAGE COMPARTMENT
BOTTOM VIEW OF INSTRUMENT
3400 6

Figure 3-1. Bottom View of the 834.

WARNING

For confirmation that the power receptacle is properly wired, refer to qualified service personnel.

The power cord is detachable (refer to Figure 3-2). When not in use, the cord can be stored in the accessory cabinet in the bottom of the 834 (refer to Figure 3-1).

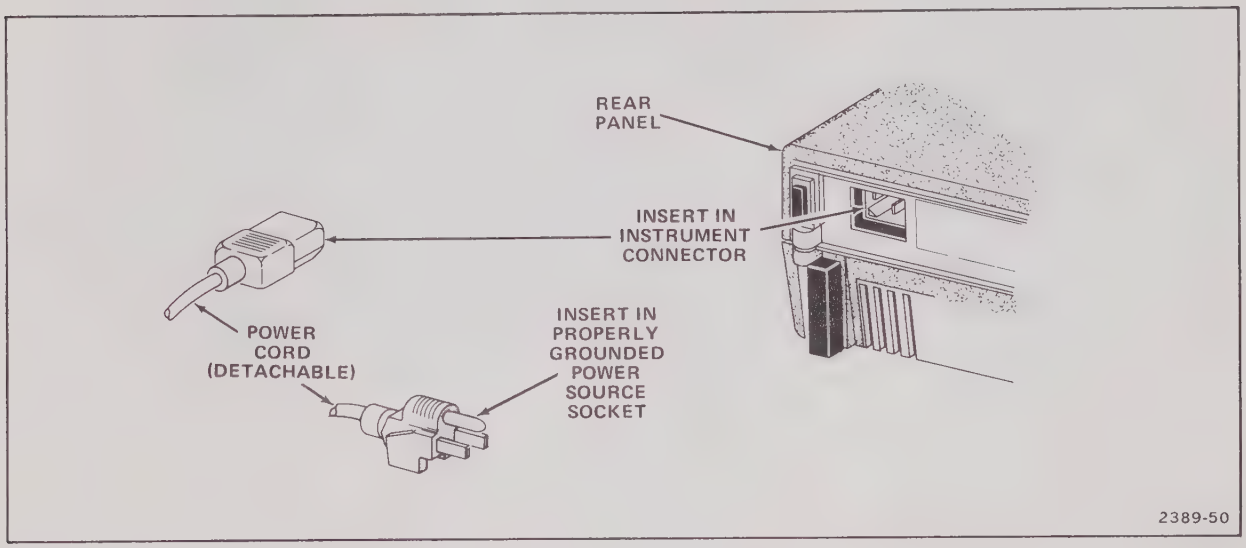


Figure 3-2. Connecting the Power Cord.

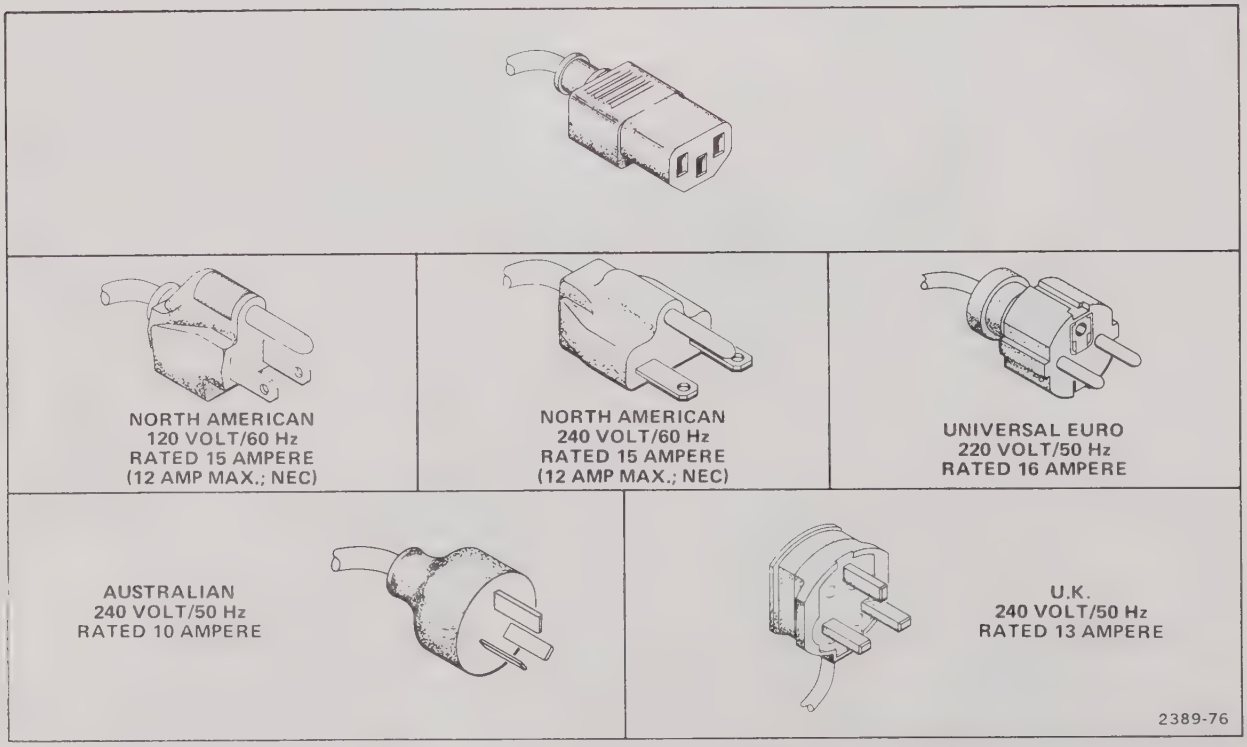


Figure 3-3. Power Cords for the 834.

Instruments are usually shipped with a 115 V power cord unless otherwise ordered. Other power cords that can be used with the 834 are shown in Figure 3-3. Contact your Tektronix representative or local Field Service Office for part number information on power cords.

Interface Connections

A standard accessory to the 834 is a RS-232 T cable assembly (refer to Figures 1-1, 1-2, and 1-3). This cable assembly can be used to connect the 834 to DTE and DCE units under test.

CONTROLS, INDICATORS, AND CONNECTORS

The 834 front panel controls and indicators are protected by a lid. To open this lid, press the buttons on each side of the case and lift.

The front panel is shown in Figure 3-4. Five areas have keys of related function and are described in this section. Connection points on the back of the 834 are also discussed.

NOTE

Some early models of the 834 have slightly different labels on the Interface Access section of the front panel.

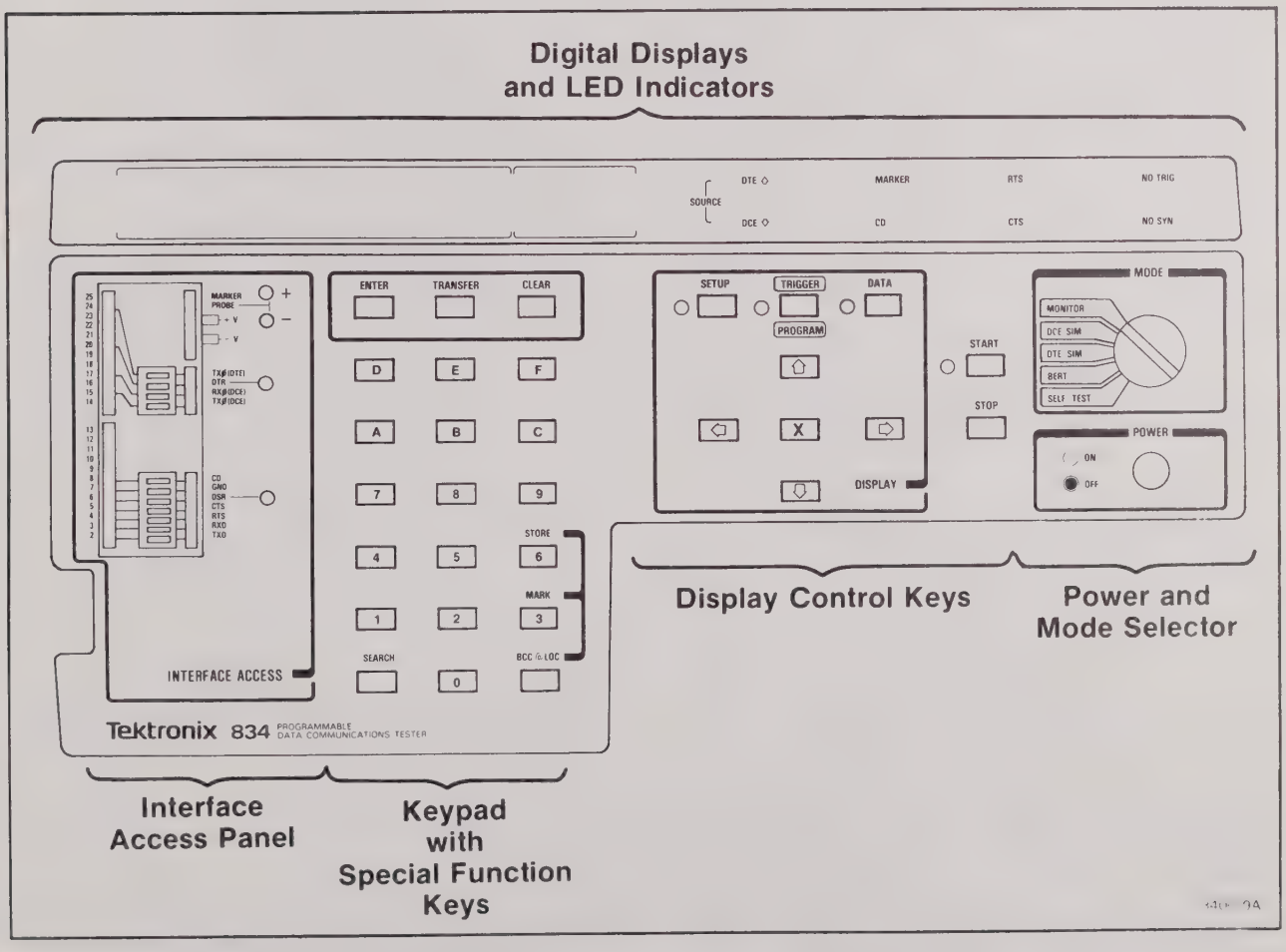


Figure 3-4. Front Panel of the 834 Programmable 834 Data Communications Tester.

Power and Mode Selection

(1) The POWER button turns the 834 on and off (push on, push off). When the instrument is on, the top of the POWER button is yellow; when off, it is black. Since the yellow color is produced mechanically, other indicators must be examined to make sure power is actually being applied to the 834.

(2) The MODE Switch is a five-position rotary dial used to select the operating mode of the 834.

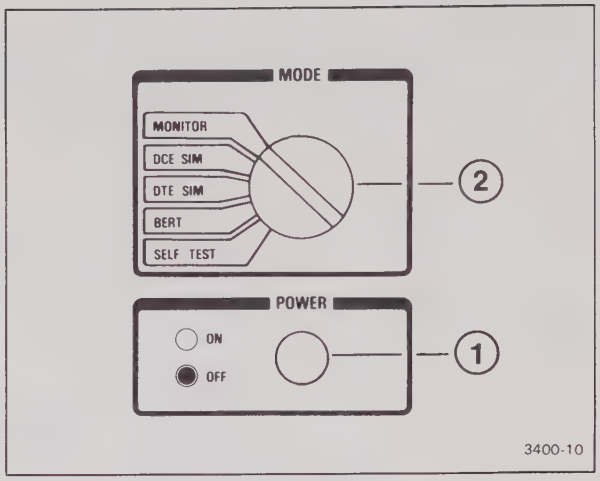


Figure 3-5. Power and Mode Selection.

Digital Displays and LED Indicators

Data is displayed on a 16-character fluorescent, alphanumeric readout. A five-by-seven dot matrix is used to form each character. The readout is divided into a data display window (1) and a scratch pad area (2).

(1) The DISPLAY WINDOW (left-most 12 characters) displays parameters, messages, or data.

(2) The SCRATCH PAD (right-most 4 characters) displays the hexadecimal or mnemonic equivalent of the right-most character in the display window. The scratch pad also displays data entered from the keypad.

(3) The DTE SOURCE indicator illuminates when the right-most character in the display window is received from the Data Terminal Equipment (DTE).

(4) The DCE SOURCE indicator illuminates when the right-most character in the display window is received from the Data Communications equipment (DCE).

(5) (6) (7) (8) The MARKER, CD, RTS, and CTS indicators show the status of key RS-232 interface lines. An illuminated LED indicates an ON condition. Normally, the indicators show the real time status of the lines. When captured data are displayed, these indicators show line status at the time the right-most displayed character was received.

- The MARKER indicator can be connected to any available interface line at the access panel. The ON condition indicates a HIGH logic level (positive voltage; Space).
- CD—CARRIER DETECT. The ON condition indicates that the DCE is receiving a valid carrier signal.

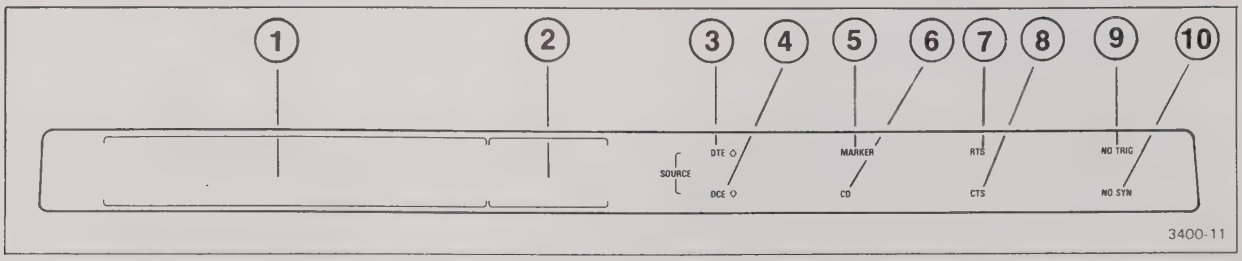


Figure 3-6. Digital Displays and LED Indicators.

- RTS—Request to Send. This is a signal from the DTE to the DCE. It is used with CTS to indicate the status of the handshake protocol between the DTE and DCE.

- CTS—Clear to Send. This is a signal from the DCE to the DTE. It is used with RTS to indicate the status of the handshake protocol between DCE and DTE.

(9) If the 834 is in Monitor mode and a trigger has been defined, the NO TRIG indicator illuminates when START is pushed and remains on until the trigger is found.

(10) The NO SYN indicator illuminates when synchronization with incoming data has not been achieved or has been lost. This indicator is applicable to synchronous protocols and the Bit Error Rate Testing (BERT) Mode.

Display Control Keys

(1) The START key begins data acquisition or program execution. The indicator next to the key is on when the 834 is acquiring data, performing a simulation program, or performing a BERT test.

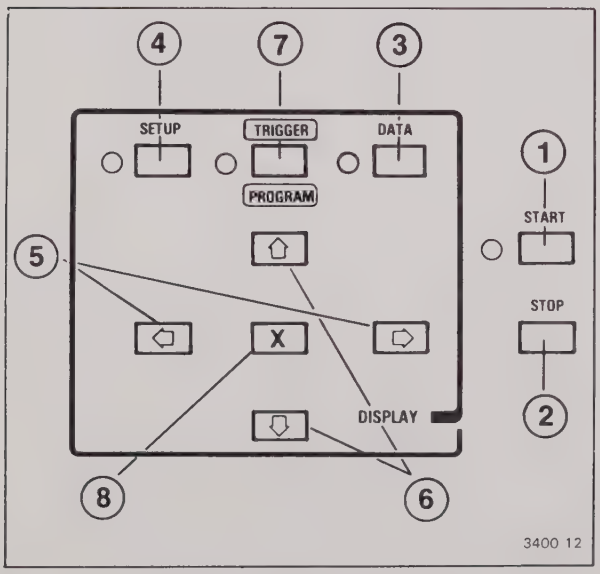


Figure 3-7. Display Control Keys.

(2) The STOP key stops data acquisition or program execution. In the idle state, captured data can be read, setup and program parameters can be changed, and the mode selection can be changed.

(3) The DATA key displays the contents of the capture buffer. The capture buffer stores both received and transmitted data.

(4) The SETUP key calls up the first entry of the setup parameter menu. Setup parameters may then be selected or reviewed.

(5) (6) The ARROW keys are used to move through menus. The up and down arrow keys scroll through different menu items. The left and right arrow keys scroll through the selections available for each item.

(7) The TRIGGER/PROGRAM key performs different functions depending on the mode selection.

- In Monitor mode, the key calls up the first entry of the trigger menu. A trigger may be defined or reviewed.
- In the Simulate modes, the key calls up the first level in the program definition menu. A simulation program may be defined or reviewed.

(8) The X key is used in reviewing simulation programs.

Keypad with Special Function Keys

The 21-button keypad is used with the Display Control Keys to program the 834 with user-defined conditions.

Keys 0–9 and A–F are used to enter decimal and hexadecimal digits. As digits are entered, they are displayed in the scratch pad display area.

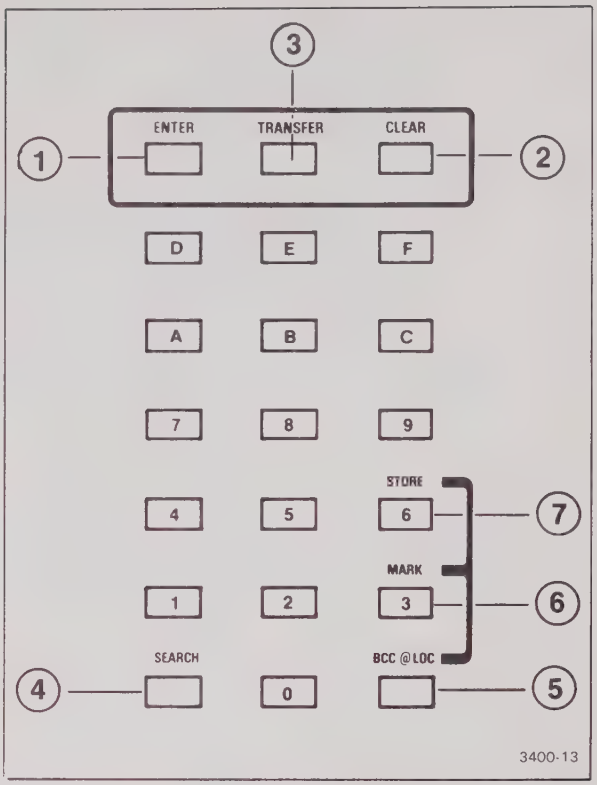


Figure 3-8. Keypad with Special Function Keys.

(1) The ENTER key enters decimal or hexadecimal values into the currently displayed menu item.

(2) The CLEAR key clears:

- The scratch pad.
- The right-most character of displayed data.
- Simulation program steps, messages, and parameters.

Refer to Editing Messages for more information on the use of the CLEAR key.

(3) The TRANSFER key:

- Transfers one of the standard messages stored in the 834 to the message buffer currently displayed. TRANSFER also allows access to user-defined messages, and additional ROM Pack menu items.
- Transfers the contents of the capture buffer to the message buffer currently displayed.
- Calls up one of the utility functions stored in the 834 (for example: Delete all characters to left of current position).
- Calls up one of the programs stored in the 834 (for example: Untriggered Repeat).

(4) The SEARCH key locates the next occurrence of a user-selected character in the capture buffer. The display also stops at each End of Frame (EOF) symbol. See Character Search for details on the use of this key.

(5) The BCC@LOC, MARK, and STORE keys are used together to implement Block Check Character (BCC) calculations. See BCC Verification and BCC Calculation for instructions on how to check and store BCC's.

Interface Access Panel

(1) Eleven two-position, Single Pole-Single Throw (SPST) switches are used to connect and disconnect selected lines from the 834 to the interface. For standard interface configurations, these switches should be in the closed position.

(2) The DSR (Data Set Ready) indicator shows the real time status of interface line 6. The LED illuminates with an asserted condition for the line.

(3) The DTR (Data Terminal Ready) indicator shows the real time status of interface line 20. The LED illuminates with an asserted condition for the line.

(4) The +V and -V pins can be connected with a jumper wire to any interface line to pull the line high (+V, Space) or low (-V, Mark).

(5) The PROBE pin can be connected with a jumper wire to any interface line. The logic level of the line is reflected by the + and − symbols.

- + illuminates at a high logic level.
- − illuminates at a low logic level.

(6) The MARKER pin can be connected with a jumper wire to any interface line. The status of the line is stored with each received character and reflected in the MARKER LED indicator on the display panel (see Figure 3-6).

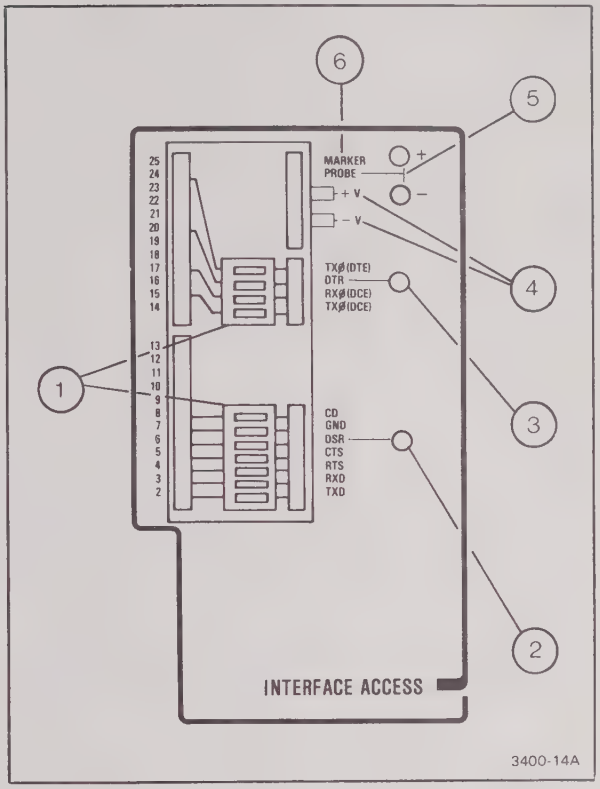


Figure 3-9. Interface Access Panel.

834 Interface Connectors

(1) This connector is a 25-pin "D" type (female socket contacts) for connecting the 834 to the equipment under test.

(2) This connector is designed for a Current Loop Interface Adapter (834 Option 2).

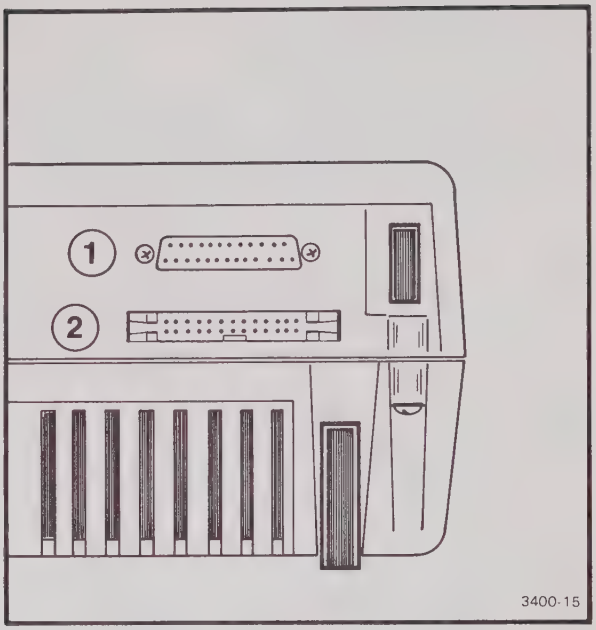


Figure 3-10. 834 Interface Connectors.

ROM Pack Connector

The connector shown in Figure 3-11 is intended only for use with Tektronix User 834 ROM Packs.

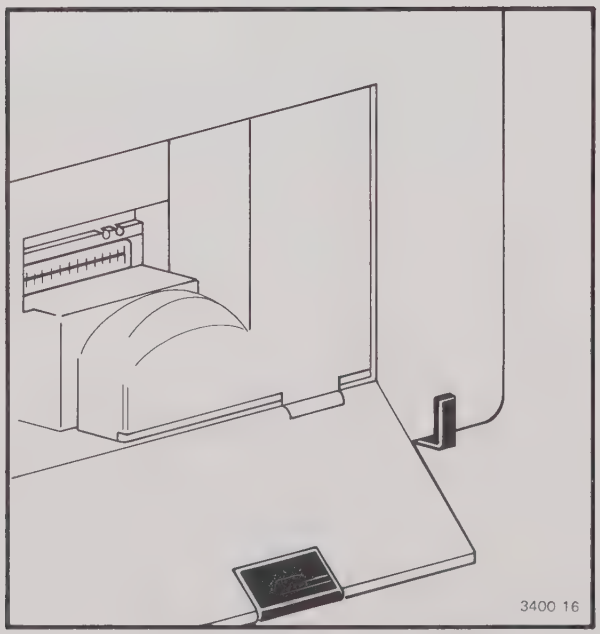


Figure 3-11. ROM Pack Connector.

SETUP

The SETUP process allows the user to define basic system conditions for each mode switch setting. Refer to the foldout at the back of this manual for a chart of the SETUP selections available under each setting. The items in bold are the default selections.

To access the setup menus, press the SETUP key. Use the up and down arrow keys(↑, ↓)to move between different setup menu items. Use the left and right arrow keys(← , →) to scroll through the available selections for each menu item.

A setup example is discussed at the end of the SETUP section.

SETUP for MONITOR, DCE SIM, and DTE SIM Modes

CODE. This menu item allows the user to specify which translation code is to be used in displaying incoming binary data. Standard translations are:

EBCDIC	Extended Binary Coded Decimal Interchange Code, an IBM 256 character code. Control characters are decoded as 3 character mnemonics in the scratch pad area of the display (see Tables 3-8 and 3-9). A hex-EBCDIC conversion chart is provided in Table 3-6.
EBCDIC$_{hx}$	Equivalent to EBCDIC (above), except that control characters are displayed as hex pairs in the scratch pad area.
ASCII	American Standard Code for Information Interchange, a standard 128 character code. Control characters are decoded as 3 character mnemonics in the scratch pad area (see Tables 3-7 and 3-9). A hex-ASCII conversion chart is provided in Table 3-5.
ASCII$_{hx}$	Equivalent to ASCII (above), except that control characters are displayed as hex pairs in the scratch pad area.
HEX	All data is displayed as hex pairs.

The default code is EBCDIC. Additional codes may be added using manual ROM generation procedures.

BAUD. This menu item allows the user to specify the data rate at which the 834 transmits and receives data. The available selections are:

50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, and 19,200 bits per second.

The default baud rate is 1200 bits per second. Additional baud rates may be added using manual ROM generation procedures.

DUPLEX. The available selections are FULL and HALF. This menu item pertains to DTE SIM and DCE SIM modes only. In half-duplex, the 834 performs RS-232 handshaking with programmable line turnaround delay (see Delay below, and Half-Duplex Line Turnaround later in Section 3). The default selection is FULL.

DELAY. This menu item allows the user to specify, for DCE and DTE simulations, the delay between the time RTS is raised and CTS is raised in response. The default selection is 200 ms, but values from 0 to 9999 milliseconds (10 millisecond resolution) can be entered. Delay does not apply to full-duplex or MONITOR mode operation.

To clear the delay value shown in the display, press the CLEAR key. Enter the new value using the keypad, then press the ENTER key.

SETUP. The 834 supports four types of data transmission: synchronous, asynchronous, HDLC (High-level Data Link Control), and block asynchronous (ASYNBLK). As seen in the foldout, the subsequent menus vary according to the type of data transmission selected. The default is SYNC.

ASYNC and ASYNBLK appear to have the same menu selections; however, ASYNBLK is affected by the BCC and IDLE items whereas ASYNC is not. These items can be reviewed or changed only by moving down the SETUP = SYNC branch. To access these items, change SETUP from ASYNBLK to SYNC; step downward through the SYNC menu sequence to BCC and IDLE to review or change the settings; move back up to SETUP and change SYNC back to ASYNBLK.

BITS/CHR. Bits per character selections differ between the SYNC and ASYNC setups; verify the available settings on the foldout. The default in either case is 8.

The bits per character setting includes the parity bit. ODD or EVEN parity is required with the nine bits per character setting. Five bits per character cannot be run with parity.

PARITY. The default parity selection under SYNC and ASYNC is NONE. Other available selections are ODD, EVEN, MARK, and SPACE. If MARK or SPACE is selected, the 834 transmits with the parity bit set either high or low, respectively. The 834 does not check parity on received data if either of these two settings is selected.

BCC. Error checking by block check character is available under SYNC, but also applies to ASYNBLK (see above). CRC-16 (cyclical redundancy checking) is typically used with EBCDIC. LRC (longitudinal redundancy checking) is standard with ASCII. The default is CRC-16.

SYN. The default selection is hexadecimal 3232 (two EBCDIC SYN characters). To clear the value shown in the display, press the CLEAR key. Enter the new value (two hexadecimal digits for each SYN character) using the keypad then press the ENTER key. The SYN selection can be one or two characters; if two characters, they can be different.

EOF. End of Frame. In SYNC, the default selection is hexadecimal 37 (the EBCDIC EOT character); in ASYNC, the default is 0A (the ASCII new line character). Clear the existing EOF character, if necessary, by pressing the CLEAR key, then enter a new hexadecimal value with the keypad and press ENTER. Some protocols require that this menu item be left clear.

The RECEIVE instruction requires an EOF to define the end of a frame. Most synchronous systems define the end of a frame with an idle line instead of EOF (see IDLE menu selections).

IDLE. This setup condition determines how many characters/events will define an idle line. A selection of 4 or 8 indicates that four or eight sequential occurrences of MARK, SPACE, or SYN define an idle line. The default selection is 4. The 8 MARK, 8 SPACE, and 8 SYN selections set up the 834 to consider the line idle after detecting eight sequential characters of all marking bits, eight sequential characters of all spacing bits, or eight sequential SYN characters. If 4 or 8 is selected, either a marking line, a spacing line, or a synchronizing line terminates a frame.

CLK. This setup condition specifies the source of the baud rate clock when in a synchronous setup or HDLC mode. NORMAL indicates that the 834 generates the clock; DERIVED indicates that the clock is derived from data transitions; DTE is the same as NORMAL except that the T-Data clock is supplied by the DTE device. The default selection is NORMAL.

Refer to Table 3-10, Simulation Clocking.

NRZI. Non-Return to Zero, Inverted. NRZI is typically used for data derived clocks. The default selection is OFF. This menu item pertains to HDLC.

STOPBITS. Systems operating at over 300 baud typically use 1 stop bit. Systems using Baudot code typically use 1.5 stop bits. Two stop bits are typically used in systems running at less than 300 baud. The default selection is 1.

This menu condition determines only the number of stop bits transmitted by the 834. The 834 always checks for 1 stop bit when receiving data.

TIMING. This setup condition specifies the source of the baud rate clock when in asynchronous mode. NORMAL indicates that the 834 generates the clock. In ISOCH (isochronous), the 834 uses the DCE clock to transmit and send asynchronous data. This allows asynchronous data to be sent over synchronous modems.

Refer to Table 3-10, Simulation Clocking.

SETUP for BERT Mode

BAUD. This item allows the user to specify the data rate at which the 834 transmits and receives data. Refer to the foldout for the available selections. The default is 1200 bits per second.

PATTERN. This setup condition specifies the total test length in bits. The default selection is CONT (continuous); given this selection, the 834 transmits and monitors the pattern continuously until STOP is pressed. If 10E5 or 10E6 is selected, the test continues until 100,000 or 1,000,000 bits are tested, respectively.

SETUP. BERT can be run with synchronous or asynchronous systems. As seen in the foldout, the setup menus branch according to the type of data transmission selected. The default selection is SYNC.

CLK. This item specifies the source of the baud rate clock when operating in synchronous mode. NORMAL indicates that the DCE device generates the clock. DERIVED indicates that the clock is derived from data transitions. DTE is the same as NORMAL except that the T-Data clock is supplied by the DTE device.

BITS/CHR. Bits per character selections are offered only under ASYNC. Refer to the foldout for the available selections. The default selection is 8 bits per character.

PARITY. The default parity selection under ASYNC is NONE. Other available selections are ODD, EVEN, MARK, and SPACE. If MARK or SPACE is selected, the 834 transmits with the parity bit set either high or low, respectively. The 834 does not check parity on received data if either of these two settings is selected.

STOPBITS. Systems operating at over 300 baud typically use 1 stop bit. Two stop bits are typically used in systems running at less than 300 baud. The default selection is 1.

SETUP Example

The following example demonstrates the setup conditions required for the 834 to perform DCE simulation with a typical asynchronous, ASCII terminal such as the TEKTRONIX 4025. The operating conditions for the terminal in the example (and the conditions that must be reflected by the setup) are:

- ASCII translation code
- 1200 baud
- Full duplex
- Asynchronous data transmission
- 7 bits per character
- 1 stop bit
- EOF=OD (ASCII carriage return)
- Baud rate clock generated by the 834

Press SETUP. The 834 displays CODE = EBCDIC ← → .

Press → ← to move the display to ASCII.

Press ↓ . The display is BAUD = 1200 ← → . — This default value is the desired setting; no change is necessary.

Press ↓ . The 834 displays DUPLEX = FULL ← → . — Again, the default setting is appropriate; proceed to the next item.

Press ↓ . The 834 displays DELAY = 200. — Delay has no effect in full duplex operation; proceed to the next item.

Press ↓ . The 834 displays SETUP = SYNC ← → .

Press → → to move the display to ASYNC.

Press ↓ . The 834 displays BITS/CHR = 8 ← → .

Press ← to move the display to BITS/CHR = 7 ← → .

Press ↓ . The 834 displays PARITY = NONE ← → . — This is the desired setting; no change is necessary.

Press ↓ . The 834 displays STOPBITS = 1 ← → . — No change is necessary.

Press ↓ . The 834 displays EOF = 0A. — 0A is the hexadecimal value for an ASCII "new line" character. The example requires an EOF of 0D (ASCII carriage return).

Press CLEAR. — 0A is cleared from the display.

Enter 0D on the keypad. — Notice that the values entered are shown in the scratch pad area of the display. If you make a mistake, press CLEAR and re-enter the data.

Press ENTER.

Press ↓ . The 834 displays TIMING = NORMAL ← → . — No change to this setting is necessary.

Timing is the last setup condition under ASYNC. If necessary, press ↑ repeatedly to review the selected settings. Remember that the setting shown in the display when you move up or down to another setup condition is the setting in effect.

DCE/DTE SIMULATE

In the SIMULATE modes, the 834 can simulate a DCE or a DTE device. The sequence of events is controlled by a program created by the user and stored in the 834.

A simulation program is composed of three types of data: 1) program steps (one program instruction per step), 2) messages, and 3) parameters. A program may contain up to 99 separate program steps. Each step may be one of 11 program instructions. Some program instructions specify one of 50 message buffers to indicate the data used during that step. Other instructions specify one of 50 parameter buffers which store numerical data such as time-out or delay information. Refer to Program Language Descriptions for details on the individual instructions and a sample program; refer to Table 3-11, Basic 834 Instruction Set, for a brief overview.

Set the mode switch to either DCE SIM or DTE SIM.

SETUP conditions are selected in the same manner as previously described.

Program Steps

The format for selecting PROGRAM STEPS is as follows:

Press PROGRAM. The 834 displays PROGRAM STEPS.

Press CLEAR to erase any previous sequence of program steps.

Press ↓ . The 834 displays 1 HALT: 0 .

HALT is the first instruction. Press the left or right arrow keys (←, →) to move through the other instructions. The instruction displayed when you move to program step 2 is the one selected. The other program instructions are: SEND:, RECEIVE, COMPARE#, JUMP EQ →, JUMP NE →, JUMP →, IF TIME →, TIMEOUT#, MASK:, and WAIT#. See Program Language Descriptions for details on each instruction.

Press → . The 834 displays 2 HALT: 0 .

Follow the same procedure to select the instruction for the second program step. Continue selecting program steps as necessary. One program may contain a maximum of 99 steps.

Messages

Entering Messages

The format for selecting MESSAGES is as follows:

Press PROGRAM → . The 834 displays MESSAGES: *nnnn*.

nnnn represents the number of characters remaining in message buffer space. Fifty separate messages are allowable, 3000 characters total.

Press CLEAR to erase any existing messages.

Press ↓ . The 834 displays 1M: <empty>.

Enter messages into a message buffer by individually entering the desired characters. Enter ## (where ## is the hexadecimal value of the desired character) and press ENTER. Press CLEAR to clear an individual character.

Press ↓ to access message buffer 2. Follow the same procedure for entering additional messages.

Reading Messages

Press 0 → to go to the front of the message.

Hold down (or repeatedly press) ← to read the message.

Press 0 ← to go to the last character location in the message.

Editing Messages

Position the character to be changed at the right end of the display window.

Press CLEAR to delete the character.

Enter the hexadecimal value of the new character. If you make an error, press CLEAR. Notice that only the scratch pad clears. The CLEAR key will clear the scratch pad first; if the scratch pad is empty, the right-most character in the display window is cleared.

Press ENTER.

Transfer Function Messages. Seven standard messages are stored in the 834 as Transfer Functions. Refer to Table 3-1 for a brief description of the messages plus the other 834 transfer functions. Press the value of the desired message then press TRANSFER to transfer the message to the message buffer currently displayed. If data already exists in the message buffer, the transferred message will be inserted immediately following the right-most character in the display window. Remember A message can only be transferred into a currently displayed message buffer.

Message Buffer Transfer. Data in the message buffer currently displayed can be copied into the capture buffer by pressing C,TRANSFER. Any data in the capture buffer is replaced with the message.

Capture Buffer Transfer. Data in the capture buffer may be transferred to the message buffer currently displayed by pressing F,TRANSFER. If data already exists in the message buffer, the transferred data will be inserted immediately following the right-most character in the display.

Message Editing Exercise. The following exercise demonstrates some of the editing capabilites of the 834.

Current conditions:

1M: THE QUIK BROWN FOX JUMPED OVER A LAZY DOG. 0123456789

Desired results:

1M: THE QUICK BROWN FOX JUMPS OVER A LAZY DOG.

Press PROGRAM, → ,then ↓ to move message 1 into the display window. Only the last 12 characters of the message are displayed.

The first correction to message 1 is to insert a C in QUIK. Manipulate the message so that the letter I is in the right-most position in the display window. One way to perform this manipulation is: Press 0 → to move to the beginning of the message then press 7 ← to move the display seven characters to the left (This is equivalent to pressing ← seven times.). Enter the hexadecimal value for C using the keypad then press ENTER. C is now in the right-most position.

The next correction is to replace the letters ED of the word JUMPED with S. Position the message so that D is in the right-most position in the display window by pressing ← repeatedly (or by pressing 18 ←). Press CLEAR. Notice that D is cleared and E moves into the right-most position of the display. Press CLEAR again; E is cleared and P moves to the right-most position. Enter the hexadecimal value of S using the keypad then press ENTER. S is inserted in the right-most position of the display.

The remaining correction is to delete the numbers (0-9) at the end of the messsage. Position the message so that the period (.) is the right-most character in the display window by pressing ← repeatedly (or by pressing 17 ←). Delete all characters to the right of the right-most position by pressing 11,TRANSFER (see Clearing Messages below).

Clearing Messages

Press 10 TRANSFER to clear all characters to the left of and including the right-most character in the display. If the right-most character is the end of the message, this procedure clear the entire message.

Press 11 TRANSFER to clear all characters in the buffer to the right of the right-most character in the display window.

BCC Generation

The 834 calculates a CRC-16 or an LRC-8, depending on which BCC has been selected at setup. If an HDLC setup is selected, the 834 automatically calculates CRC-CCITT for the message being sent and checks the CRC for any HDLC frame received. CRCs are not included in the received HDLC frame when it is displayed.

Select the desired message.

Press ← or → untill the first character to be included in the calculation is positioned at the right end of the display.

Press MARK BCC @ LOC.

Press ← untill the desired ending location is reached (last character at the right end of the display).

Press STORE BCC @ LOC. The 834 calculates the BCC and stores it in the the two locations immediately following the location of the last character in the calcutation.

Parameters

The format for selecting PARAMETERS is as follows:

Press PROGRAM → → . The 834 displays PARAMETERS.

Press CLEAR to clear any existing parameter values.

Press ↓ . The 834 displays 1P=0. This indicates that the first parameter has a numerical value of zero.

Enter the desired value via the keypad and press ENTER. Press CLEAR to erase an individual parameter.

Press ↓ to access parameter 2. Follow the same procedure.

Skipping Locations

Press 0 → or 0 ← to shift the display to the first or last entry in a horizontal series. This function is useful when working with a long list of setup selections, the list of program instructions, a message, or the capture buffer.

Press 0 ↑ or 0 ↓ to shift the display to the first or last entry in a vertical series. This function is useful for skipping over setup conditions, program steps, message buffers, or parameters.

Any arrow key entry may be preceeded by a numeric entry from the keypad; the display will shift the corresponding number of entries.

Using the X Key

If the X key is pressed while a program step is shown in the diplay, the 834 then displays the message buffer, parameter, or program step referred to by the original step. The message, parameter, or step can then be reviewed or edited. Return to the original step from a message or parameter by pressing the X key again. This process allows you to verify that the program step currently in the display refers to the proper message or parameter; you can edit the data if necessary and not lose your place in the program.

If the X key is pressed and a message, parameter, or program step has not been specified, the display will show PROGRAM STEPS, MESSAGES:, or PARAMETERS.

Table 3-1
RESIDENT 834 TRANSFER FUNCTIONS

Transfer Number	Description	Type
0	ASCII "FOX"	Message
1	Untriggered Repeat	Program
2	ASCII Uppercase	Message
4	Triggered Repeat	Program
5	Full ASCII Character Set	Message
8	132 ASCII Uppercase Characters	Message
B	EBCDIC "FOX"	Message
C	Copy message buffer into capture buffer	Utility
D	EBCDIC Uppercase	Message
E	Full EBCDIC Character Set	Message
F	Copy capture buffer into message buffer	Utility
10	Delete all characters to the left of and including current position	Utility
11	Delete all characters to right of current position	Utility
12	Use alternate real time data display	Utility
13	Restore real time data display	Utility
14	Turn off extra frame check	Utility
15	Turn on extra frame check	Utility

PROGRAM LANGUAGE DESCRIPTIONS

Nomenclature Conventions

The symbols listed below have the following meanings when displayed on the 834's character display:

- A colon (:) indicates that a message (mm) is to be specified.
- An arrow (→) indicates that a program step (ss) is to be specified.
- A pound sign (#) indicates that a parameter (pp) is to be specified.

Instruction Summary

"HALT" stops execution of simulation program at this instruction.

Format:

HALT: mm

Where mm is the message to be displayed when execution stops at this instruction.

Where mm = 0, the 834 displays the message: HALT AT STEP ss, where ss is the step number of the halt instruction.

"SEND" transmits the contents of the message buffer as a single frame.

Format:

SEND: mm

Where mm is the number of the message buffer to be transmitted. No extra characters are added to the string, except CRC characters and flag fields if HDLC is used.

If in half-duplex and the line is set to receive, the 834 turns the line around to transmit using the RS-232-C handshaking protocol (see HALF-DUPLEX TURNAROUND).

"RECEIVE" makes the next complete received data frame ready for processing.

Format:

RECEIVE

Processing continues if a frame has been received since the last RECEIVE command. If not, processing stops until a complete frame is received.

In half-duplex, if the line is set to transmit, the line will be turned around to allow the frame to be received. (See HALF-DUPLEX LINE TURNAROUND.)

"COMPARE" searches the current frame in the receive buffer for an occurrence of the character sequence contained in message buffer mm. The results of the execution of this command set up a flag condition for the JUMP EQ and JUMP NE commands.

Format:

COMPARE: mm

Where mm is the message buffer containing the character sequence being searched for.

The 834 compares the first five characters of message mm against the current frame. If the first five characters of the frame do not provide a match, the 834 slides one character further into the frame and reattempts the match. This slide-match process continues until a match is found or the entire frame has been tested. Depending on the outcome, COMPARE establishes either an equal (EQ) or not equal (NE) condition.
Use the MASK instruction to fix the compare to the front of the frame and to set up a compare sequence with more than five characters (see MASK).

"JUMP EQ" Transfers program control to a specified program step number if the results of the COMPARE statement indicate an equal condition.

If no equal condition has been established, program execution begins at the next program step.

Format:

JUMP EQ → ss

Where ss is the program step number to jump to.

"JUMP NE" transfers program control to a specified program step, it the results of the COMPARE statement indicate a not equal condition. If an equal condition exists, program execution begins at the next program step.

Format:

JUMP NE → ss

Where ss is the program step number to jump to.

"JUMP" transfers program control to a specified program step.

Format:

JUMP → ss

Where ss is the program step number to jump to.

"IF TIME" transfers program control to a specified program step if the timer programmed in the TIMEOUT command expires.

Format:

IF TIME → ss

Where ss is the program step number to jump to if the timer expires.

"TIMEOUT" starts an internal downcounting timer. TIMEOUT occurs when the timer expires.

Format:

TIMEOUT# pp

Where pp is the parameter buffer number containing the timer value in milliseconds (up to 9999 with 10 ms resolution).

"MASK" determines which bits of the characters programmed in the COMPARE command are actually compared against the bits in the received data frame. If a mask bit equals 1 the corresponding data bit and compare bit are ignored. If a mask bit is 0, the corresponding data bit and compare bit are compared. (See COMPARE.)

Format:

MASK: mm

Where mm is the number of the message buffer containing the mask bit stream. The bit stream consists of hexadecimal characters entered from the keypad.

MASK eliminates the slide-match process of comparing two character strings; compares are fixed to the beginning of the frame. A compare sequence of n characters is tested against the first n characters in the current received frame. No further characters in the frame are tested. Up to 25 characters may be compared when using a mask.

Where a mask bit is 1, the corresponding bit in the compare sequence and the current frame are not compared. Where the mask bit is 0, a comparison is made. If the number of characters in te mask sequence, the mask will be padded whti 0's (00 in hexadecimal) to the length of the compare sequence. Refer to the following example.

EXAMPLE:

rec'v frame: 41 22 63 44 55 0A (hexadecimal)
compare seq: 41 42 43 44
mask seq: 60 60 60

rec'v frame: 01000001 00100010 01100011 01000100
01010101 00001010
compare seq: 01000001 01000010 01000011 01000100
mask seq : 01100000 01100000 01100000 00000000

Result: match, flag set to EQ

Turn off a programmed mask with the MASK: 0 instruction.

MASK can extend the number of characters compared in the COMPARE instruction from 5 to 25. Remember that MASK also disables the slide-match process and fixes the compare to the beginning of the frame. To extend the compare, simply program a mask with one hexadecimal character of 00; for a compare sequence of n characters, the remaining n-1 unspecified mask characters are also assumed to be 00.

"WAIT" causes program execution to stop for a time period specified. During this wait, incoming data is still monitored but no other program steps are executed.

Format:

WAIT# pp

Where pp is the parameter buffer number containing the wait value in milliseconds (up to 9999 with 10 ms resolution).

Sample Program

The following sample program demonstrates some of the basic 834 instructions. It can be used with any asynchronous ASCII terminal to demonstrate the 834's simulation capability.

Program function: Send message 1, initiate the timer, and wait for a received frame. If a frame is received, compare the contents of the frame to message 2. If there is a match, send an appropriate message and halt. If there is no match, send a "no match" message and repeat the sequence. If the timer expires before a match is made, send a "time's up" message and halt.

Messages and parameters:

1m: THE QUICK BROWN FOX JUMPS OVER A LAZY DOG 0123456789[CR][LF]

2m: FOX

3m: NO MATCH[CR][LF]

4m: MATCH[CR][LF]

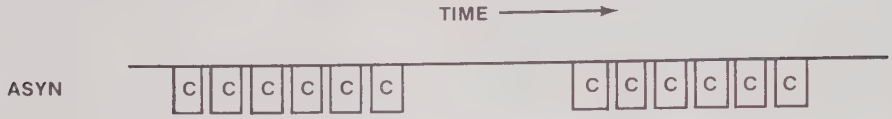
5m: TIMEOUT[CR][LF]

1p=2500

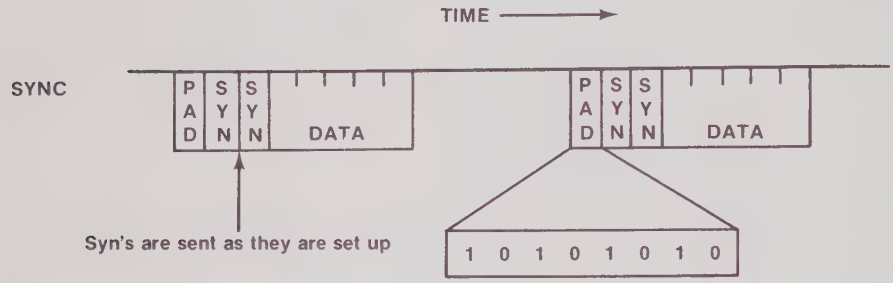
Program steps:

1	IF TIME → 11		If the TIMEOUT timer expires, transfer program control to step 11.
2	SEND : 1		Send message 1.
3	TIMEOUT # 1		Start the TIMEOUT timer; the timer will count down to 0 ms from the value entered in parameter 1.
4	RECEIVE		Wait for receipt of a frame.
5	COMPARE: 2		Compare the contents of the received frame to message 2. The flag is set to EQ if there is a match or to NE if there is no match.
6	JUMP NE → 9		If the flag is set to EQ (match), transfer program control to step 9. If the flag is set to NE, program control will pass to the following instruction.
7	SEND : 3		Send message 3, then transfer program control to step 3 to repeat the cycle.
8	JUMP → 3		
9	SEND : 4		Send message 4, then halt and display message 4 on the 834 display window.
10	HALT : 4		
11	SEND : 5		Send message 5, then halt and display message 5 on the 834 display window.
12	HALT : 5		

SEND DATA TIMING

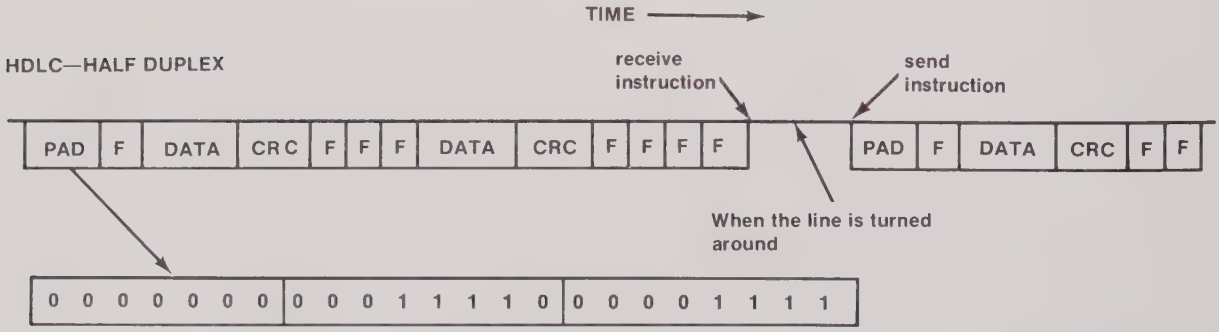


In asynchronous, the 834 transmits characters with unspecified spacing.



In synchronous mode the 834 sends a leading PAD character (1 0 1 0 1 0 1 0) and whatever syn characters are defined in SETUP.

When START is pressed, the 834 starts sending flag characters (0 1 1 1 1 1 1 0). When DATA is sent it is terminated with a CRC. At which point the 834 resumes sending flags.


TIME
HDLC—HALF DUPLEX
receive instruction
send instruction
PAD F DATA CRC F F F DATA CRC F F F F
PAD F DATA CRC F F
When the line is turned around
0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 1 1 1 1

When START is pressed the 834 sends a leading PAD (a bit position indicated above), an HDLC flag (0 1 1 1 1 1 1 0), the data, a closing CRC, and a flag. If the line is not turned around (i.e., the 834 does not execute a RECEIVE instruction), the 834 continues sending flags. If the line is turned around, the 834 goes to a line idle (all 1's).

MONITOR MODE

In MONITOR mode, the 834 reads and selectively records DTE or DCE data (either synchronous or asynchronous). In addition, the 834 records the data source and status of key interface lines (RTS, CTS, CD, and MARKER), parity and frame errors, and the mnemonic or hex decode associated with the right-most character in the data display.

Press SETUP. SETUP conditions are selected in the same manner as previously described.

Programming a Trigger

In the MONITOR mode, the trigger parameters define the trigger event used to capture data. Selection of trigger parameters is very similar to the selection of setup conditions. The available trigger selections are discussed below.

The 834 can be programmed to trigger on 1) a character sequence, 2) an error condition, 3) a marker transition, or 4) a combination of the previous three trigger conditions can be selected so that the 834 triggers on the first condition satisfied.

Press TRIGGER. The 834 displays:

NO TRIG SET if no trigger is specified or if a data trigger is specified but no data path (DTE or DCE) is selected.

NO TRIG FOUND if a trigger is specified but not found.

MATCH TRIG FOUND if a data trigger or MATCH (with or without mask) was found during the last data acquisition.

ERROR TRIG FOUND if the 834 triggered on a specified error condition during the last data acquisition.

MARKR TRIG FOUND if the 834 triggered on a high- or low-going condition for a specified interface line.

Press ↓ . The 834 displays POS @ END ← → . The trigger position is selectable (START, CENTER, END) using the left and right arrow keys (← →). Refer to Figure 3-12 for trigger positioning illustrations.

When the trigger position is at START but no trigger sequence has been specified, the 834 will acquire data until the buffer fills, then go to an idle state displaying the BUFFER FULL message. In any other position if no trigger sequence is specified, the 834 continues monitoring data until STOP is pressed.

Press ↓ . The 834 displays MATCH=NONE ← → . This item allows the user to select the incoming data source to compare with the trigger: NONE, DCE, or DTE. Use the left and right arrow keys (← →) to select the appropriate data source. MATCH=NONE indicates that the 834 will not trigger on data.

Press ↓ . The 834 displays T: <empty>. Up to 25 characters may be programmed in the trigger, but only the first five characters are compared if there is no mask programmed. If a trigger is used in conjunction with a mask, all trigger characters (up to 25) are compared but only with the same number of characters of the received data frame (up to 25).

Enter the hexadecimal value of the desired trigger character from the keypad and press ENTER. Repeat this process to enter more characters. Characters may also be inserted and deleted as they are in the message buffer (see Editing Messages.)

NOTE

If the trigger is programmed in conjuction with a mask, all unmasked bits are compared against acquired data, starting at the beginning of each frame.

If no mask is programmed, only the bits in the first five trigger characters are compared against the received data frame. The trigger operates in a slide-match mode. As each new character is recevied, a new match is attempted between the most recently acquired characters and the trigger sequence.

Press ↓ . The 834 displays M: <empty>. The mask consists of a string of hexadecimal characters which are entered from the keypad. Up to 25 characters may be programmed in the mask buffer. Where the mask contains 1's, the corresponding trigger and data bits are not compared. Where the mask contains 0's, a match is attempted. Refer to Figure 3-13.

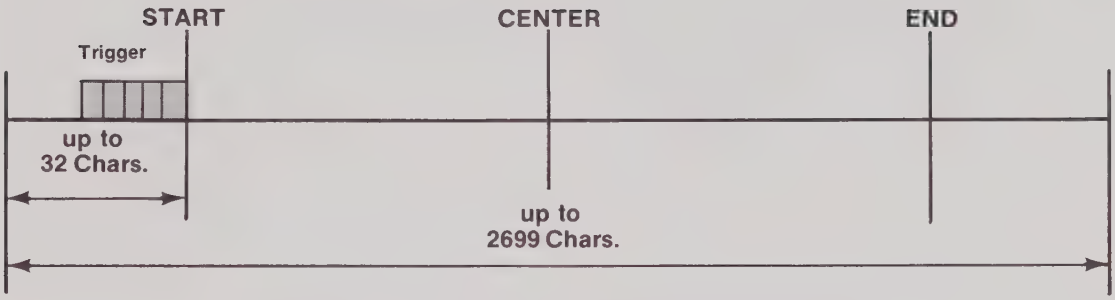
The first n mask characters always correspond to the first n trigger characters. Unspecified mask characters will be assumed to be all zero's. When the mask is entered, it will be decoded in the code specified in SETUP. It is necessary, therefore, to set the CODE menu item to HEX in order to see the display in HEX.

The mask feature is useful in the case of Bit Oriented Protocols, allowing the 834 to trigger on a particular address and control bit combination.

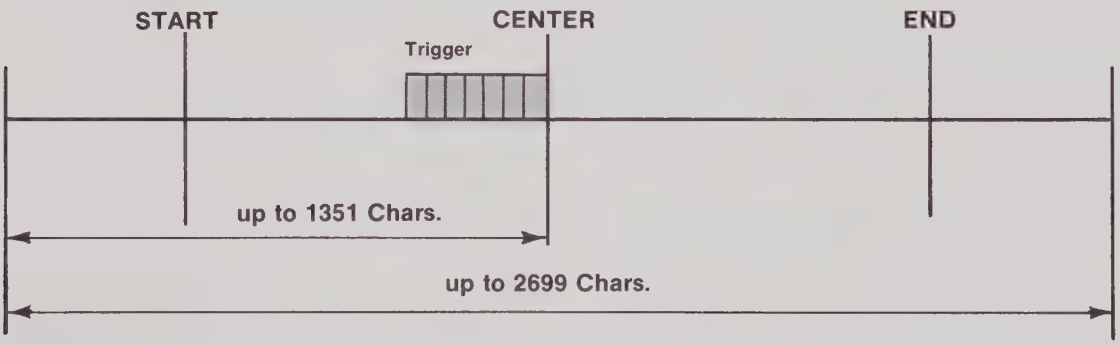
NOTE

When programming a mask, see the binary hexadecimal code conversion charts at the end of this manual (Tables 3-5 and 3-6).

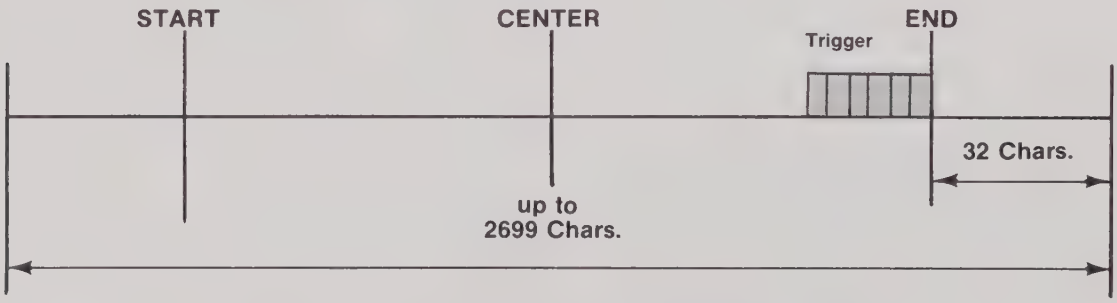
Press ↓ . The 834 displays ERROR=OFF ← → . To program the 834 to trigger on an error condition, use the → key to set ERROR=ON.



START The 834 can receive up to 32 characters before and including the first trigger event. Following characters may total up to 2699.



CENTER The 834 can receive up to 1351 characters before and including the first trigger event. Following characters may total up to 2699.



END The 834 can receive up to 32 characters after the first trigger event. Previous characters may total up to 2699.

3400-17A

Figure 3-12. Trigger Positioning: START, CENTER, END.

Error conditions are as follows:

- ASYNC=parity error
  =frame error
  =break (a character of all 0's with no start or stop bits)
- SYNC=parity error
- HDLC=CRC error or 7 1's in a row
- SHF=a short HDLC frame (<32 bits)

Press ↓ . The 834 displays MARKER=NONE ← → . Use the left and right arrow keys (← →) to select the 834 trigger event for low to high ( ) or-high-to-low ( ) MARKER input.

The 834 detects voltage levels at an unspecified sampling rate. Sampling occurs, however, at least every 10 ms.

Acquiring Data

When START is pressed, the 834 begins acquiring and displaying data. The 834 stops when the capture buffer fills or STOP is pressed.

While the 834 is acquiring data, SETUP may be pressed, and CODE and BAUD may be changed.

TRIGGER may be pressed while the 834 is acquiring data in order to verify the proper trigger setup and to see if a trigger has been found.

DATA may be pressed while the 834 is acquiring data in order to view the incoming data as it is being acquired.

If a trigger has been programmed, the 834 continues data acquisition until a trigger condition has been satisfied and the buffer is filled. The NO TRIG indicator remains ON until the trigger condition is satisfied.

If no trigger has been programmed, the 834 continues acquiring data until STOP is pressed. The NO TRIG indicator remains lit.

Reading Captured Data

The 834 must be stopped to read captured data. The tester stops when the buffer fills or STOP is pressed.

Press DATA. The capture buffer is displayed with the trigger point at the right-most position in the display window if a trigger has been found. If no trigger is found, the last character in the capture buffer is displayed in the right-most position.

Press the left or right arrow keys (← →) to scroll through the capture buffer. Data moves in the direction of the arrows.

Press 0 → or 0 ← to move to the beginning or the end of the captured data stream.

Press ↑ o ↓ to read DTE or DCE data respectively.

Press BCC@LOC to determine the buffer location of the right-most character in the display. The 834 displays CRC ???? at ## where ## is the location of the right-most character in the display. The question marks pertain to a BCC search and do not apply when determining character locations.

Press ## SEARCH to search the capture buffer for a specific character; ## is the hexadecimal representation of the character being searched for. The search proceeds from the right-most character in the display window to the last character in the capture buffer. The searched character appears as the right-most character in the display.

Press SEARCH with no specified character to search for the next EOF.

NOTE

The scratch pad area will display the hexadecimal equivalent of the right-most character in the display window. Source and control line indicators are also associated with the right-most character.

If a parity error is associated with the right-most character, the error is indicated in the scratch pad area with a small letter "p" following the hexadecimal equivalent. A framing error is indicated with a small letter "f". (A parity error is ignored if a frame error exists.)

BCC Verification

The 834 can perform a BCC check on data in a message buffer or in the capture buffer. A CRC-16 or LRC-8 is calculated depending on which has been selected in SETUP.

Use the left and right arrow keys (← →) to position the first character to be included in the calculation at the right end of the display window. Start and end search characters must be from the same data source (DTE or DCE).

Press MARK BCC.

Use the left and right arrow keys to position the last character to be included in the calculation at the right end of the display.

NOTE

Extraneous DLE and SYN characters may need to be deleted for a BCC calculation. Press CLEAR to clear any given character at the right end of the display. Deleted characters appear as a ∴ symbol. Press ENTER to restore deleted characters.

Press BCC@LOC and hold. The 834 displays BCC (or LRC)= ## ## AT @@, where ## ## is the CRC (four hexadecimal values if CRC is selected in SETUP, two hexadecimal values if LRC is selected) and @@ is the location of the right-most character in the display window.

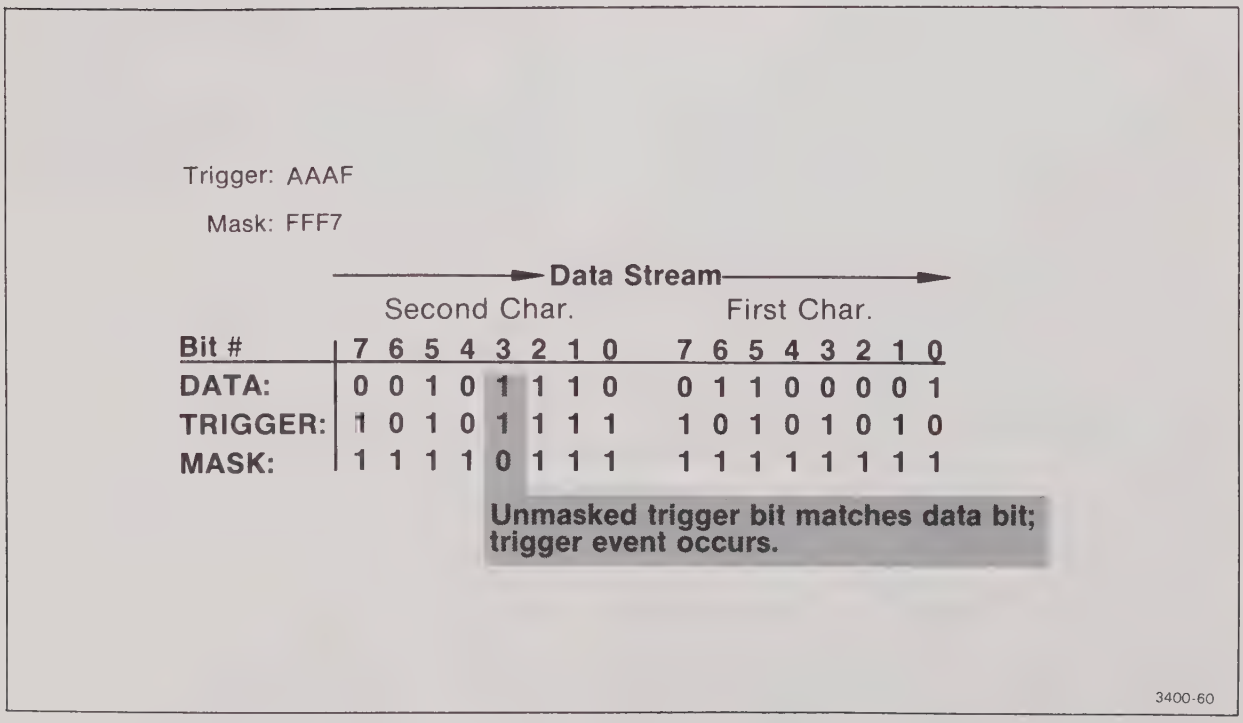

Trigger: AAAF
Mask: FFF7
Data Stream
Second Char.
First Char.
Bit # 7 6 5 4 3 2 1 0 7 6 5 4 3 2 1 0
DATA: 0 0 1 0 1 1 1 0 0 1 1 0 0 0 0 1
TRIGGER: 1 0 1 0 1 1 1 1 1 0 1 0 1 0 1 0
MASK: 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1
Unmasked trigger bit matches data bit; trigger event occurs.
3400-60

Figure 3-13. Trigger event occurs because the unmasked trigger bit matches the corresponding data bit.

BERT/BLERT

The 834 performs bit error-rate testing (BERT) and block error-rate testing (BLERT) using the 511 bit CCITT standard pseudo-random pattern sent in blocks of 1000 bits. Errors are counted continuously or over a total test length of 10E5 (100,000) bits or 10E6 (1,000,000) bits.

SETUP

(See the Setup section in this manual).

Connect the 834 to the modem using the 834's T-cable.

Set the MODE switch to BERT.

Press SETUP, display BAUD=1200. Use the → key to scroll through the available baud rates.

Press the ↓ key, display PATTERN=511. This set up parameter is not selectable.It is provided for information purposes only.

Press the ↓ key, display BITS=CONT. Use the → key to select either 10E5 or 10E6 test lengths.

Press the ↓ key, display SETUP=SYNC. Use the → key to select ASYNC if desired.(For setup async menu items see BERT SETUP in SETUP section.)

Press the ↓ key, display CLK=NORMAL. Use the → key to select DERIVED (data derived) or DTE (clock source provided by the DTE).

Press START.

BERT Operation

The 834 continuously transmits the test pattern. Once synchronized with the incoming pattern (the NO SYN LED goes out), the 834 continuously monitors for the entire test length and records errors. After the 834 stops monitoring, it continues to transmit the test pattern until STOP is pressed.

With continuous pattern transmission, the 834 continuously transmits and monitors the pattern until STOP is pressed.

DATA Displays

As soon as START is pressed and synchronization is made, the 834 begins to count and display bit errors.

The display reads:

BIT ERR = XXXX

Where XXXX = the total number of bit errors counted during the current test. If the count exceeds 9999, and overrange indication is displayed-- an overrange indication indicates that more than 9999 bit errors have been received.

The ↓ and ↑ keys can be used during the test to display the following data:

BIT ERR = XXXX
BLK ERR = XXXX
BLOCKS = XXXX
FAULTS = XXXX

BLK ERR is the total number of blocks with one or more bit-errors.

BLOCKS is the total number of blocks received.

FAULTS is the total number of times the 834 has resynchronized during the current test. The 834 attempts resynchronization after an excessive number of bit errors has occurred. If a fault has occurred an "F" appears in the scratch pad area of all BERT data displays and remains there until a new test is started.

Injecting Bit Errors

Single bit errors may be injected into the bit stream by pressing the ENTER key.

Resetting Counters

All counters may be reset while under test by pressing the CLEAR key. All counts are reset to zero and the receiver is re-initialized without interrupting the transmitted pattern.

BAUD	=	(1200, 1800, 2400, 4800, 7200, 9600, 19200, 50, 75, 110 134.5, 150, 200, 300, 600)
BITS	=	(CONT, 10E5, 10E6)
SETUP	=	(SYNC, ASYNC)
BITS/CHAR	=	(8, 9, 5, 6, 7) Nine bits per character must be used with odd or even parity. Five bits per character may not be used with parity.
PARITY	=	(NONE, ODD, EVEN, MARK, SPACE)
STOP BITS	=	(1, 1.5, 2)
CLK	=	(NORMAL, DERIVED, DTE)

Definitions

BITS = Total number of bits received in one BERT test.

CONT = Continuous

10E5 = 100,000 bits

10E6 = 1,000,000 bits

STOP BITS = Used in ASYNC setup only

NORMAL = In SYNC setup the clock signals supplied by the DCE device are used.

In ASYNC setup the pseudo-random pattern is broken up into 8-bit characters framed by start and stop bits.

DERIVED = Clock derived from received data transitions

DTE = Same as NORMAL except in SYNC setup the T-data clock is supplied by the DTE device.

SELF TEST MODE

Introduction

All test equipment should be checked for proper operation before it is used in the field. An 834 operator can quickly achieve a high degree of confidence in the operation of the 834 by running the resident exercising routines available in the SELF TEST mode. The routines are selected from a menu, and the displays generated indicate successful or unsuccessful completion of the tests.

Observe the following conditions before using SELF TEST:

- Set the mode switch to SELF TEST.
- Disconnect all external devices except the power cord and User ROM Pack (if any).
- Close all switches on the Interface Access Panel.

The SELF TEST menu offers four levels of exercising routines (see Figure 3-14).

LEVEL 1: The Self-Test, Mode Switch, and External Data tests thoroughly exercise the 834. The user need run only these tests to have confidence in the operation of the 834.

LEVEL 2: The Power-Up, Display, and Internal Data tests are combined to form the Self Test routine accessible in level 1. These tests may be accessed individually from this level.

LEVEL 3: The List-ROM routine displays descriptive information on any 834 ROM. Part number information is displayed for Tektronix-supplied ROMs. This feature is useful for verifying that the proper ROMs are in place.

LEVEL 4: The Service-Nonmaskable Interrupt (SVC-NMI) loop is designed for service personnel. No error messages are generated.

Use the left and right arrow keys to scroll through the tests on each level. Use the up and down arrow keys to move between levels. Press START to begin a test. In most cases where an error message is generated, press any key on the front panel to return to the menu. Occasionally, it may be necessary to turn the 834 off then on again.

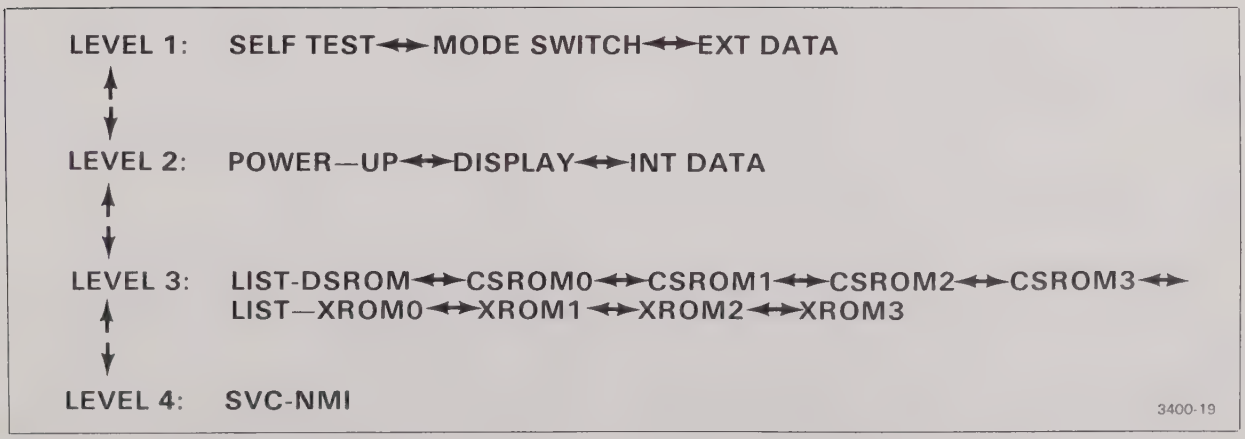

LEVEL 1: SELF TEST ↔ MODE SWITCH ↔ EXT DATA
LEVEL 2: POWER—UP ↔ DISPLAY ↔ INT DATA
LEVEL 3: LIST-DSROM ↔ CSROM0 ↔ CSROM1 ↔ CSROM2 ↔ CSROM3 ↔
LIST—XROM0 ↔ XROM1 ↔ XROM2 ↔ XROM3
LEVEL 4: SVC-NMI
3400-19

Figure 3-14. Self Test Menu.

Enter a number *n*(1-9999) before pressing START to cause the 834 to run the test *n* times. If 0 START is entered, the 834 continues the test until an error is found or the 834 is turned off. If no number is entered, the test is executed once. Turn the 834 off to end a long sequence of tests.

After START is pressed, the display reads TEST STARTED *n* where *n* is the number of times the test will be run. If a test is run more than once, the value of *n* decreases with each display of the message.

The SELF TEST routines can generate many error messages. Very few messages indicate conditions that the operator can fix. Those messages are discussed in this section under the appropriate tests. All other error messages indicate conditions that must be corrected by qualified service personnel.

WARNING

To avoid personal injury, do not remove the product covers or panels. Refer operation problems to qualified service personnel.

Power-Up Test

The Power-Up test is executed every time the 834 is turned on and must be completed successfully for the 834 to be operable. The user can run the test again after the 834 is operating by selecting the Self Test routine in level 1 of the test menu or by selecting Power-Up individually from level 2.

If the 834 is turned on in the SELF TEST mode and an error condition exists, the Power-Up test displays the appropriate error message. In any other mode, the display reads 834 ERROR. In this case, the operator should turn the 834 off, change the mode setting to SELF TEST, and turn the 834 on again to see the specific error message.

If the 834 is turned on in the SELF TEST mode and there are no errors, the display reads SELF TEST ← → . In all other modes, the display is 834 READY.

The Power-Up test consists of two parts that run concurrently: Display System Check and Control System Check. One facet of the Display System check is visible to the operator as each display segment is sequentially lit. If the Display System check is successfully completed, DS OK is displayed. This display is replaced by 834 READY (or SELF TEST ← →) if the Control System check is successful.

The following Power-Up error messages indicate conditions that the operator may possibly be able to fix. If a message persists, contact qualified service personnel.

BAD KEYBOARD
BAD SWITCH
BAD XROM HEADER
BAD XROM CHKSUM
BAD XROM LIST
CS OK

BAD KEYBOARD indicates that the contacts of one or more of the front panel keys are shorted. A key is considered shorted if it is accidentally depressed during 834 power-up. Turn the 834 off, then on again making sure no keys are inadvertantly depressed.

BAD SWITCH indicates that an illegal code was read from the rotary mode switch. The mode switch may be positioned in between mode settings or may have dirty contacts. Turn the 834 off, rapidly move the mode switch through all positions several times, then turn the 834 on again.

BAD XROM HEADER, BAD XROM CHKSUM, BAD XROM LIST, and CS OK indicate problems in the external User ROM Pack. Turn the 834 off, remove the ROM Pack from the connector in the back of the 834, then turn the tester on again. Refer the ROM Pack to service personnel.

CAUTION

To prevent ROM damage, always turn the 834 off before removing or installing a User ROM Pack.

Primary Tests

The Self Test, Mode Switch, and External Data tests thoroughly exercise the 834. The user need run only these tests to have confidence in the operation of the 834. Access these tests from the first level of the SELF TEST menu.

Self Test

This test is a combination of the Power-Up, Display and Internal Data tests. No operator interaction is required. The display returns to SELF TEST ← → when all tests are successfully completed.

Power-Up. This test was discussed earlier in this section.

Display. This test checks for shorts between dots in a row or column of the fluorescent display. Press STOP to freeze the test pattern display. The display resumes when STOP is released. No error messages are generated. Detect missing dots or LEDs by carefully watching the test pattern display.

Internal Data. This test consists of three checks:

- RS-232 Control Line Check. Tests all of the internal data paths possible with the mode switch set to SELF TEST.
- Bisynchronous Mode Check. Tests the ability of the 834 to send and receive synchronous data.
- Interrupt Response Check.

Mode Switch

This test checks mode switch and RS-232 control lines in all modes. The display prompts the user when to change the mode switch setting.

After START is pressed, the display reads SET MODE=MONITOR. Rotate the mode switch to the MONITOR setting to allow the appropriate data paths to be checked. If no errors are found, the display changes to SET MODE=DCE SIM. Continue the test as prompted. If no errors are found in any mode, the display returns to MODE SWITCH ← → .

External Data

This test checks the signal path through the eleven RS-232 lines supported by the 834 (see Interface Access Block Diagram, Figure 3-15), the RS-232 connector on the back of the 834, and through any RS-232 cable attached to the tester.

The MARKER line is checked; then a 19.2 K baud data stream is sent out over the interface, read back, and checked for errors.

The following conditions must be met before the test is started.

- All switches on the Interface Access Panel must be closed.
- The MARKER pin must be connected to DTR with a jumper wire.
- An adapter configured in the following manner must be plugged into the RS-232 connector or into the end of any cable attached to the 834.

Pin 2 to: Pins 3, 10, 12, 14, 16, 18, 21, 23, 25
Pin 24 to: Pins 9, 11, 13, 15, 17, 19, 22
Pin 4 to: Pins 5, 8
Pin 20 to: Pin 6

(Standard male RS-232 connector.)

After START is pressed, the display reads SET MODE=BERT. Rotate the mode switch as prompted. After the test is completed, the display reads SET MODE=SLFTEST. Any error messages generated are not displayed until the mode switch is returned to SELF TEST. If there are no errors, the display reads EXT DATA ← → .

List ROM

This routine displays descriptive information on any ROM in the 834. This feature is useful for verifying that the proper internal system and external User ROMs are in place. The Display System ROM is designated DSROM; Control System ROMs are designated CSROM0 through CSROM3. ROMs in User ROM Packs are designated XROM0 through XROM3.

"List ROM" displays part number information for Tektronix-supplied ROMs. The display contains the designation of the ROM plus the last six digits of the Tektronix part number as shown in the following example:

CSRM1:PN- *nnnn*

ROM Packs may contain user-programmed ROMs. These ROMs may not provide any descriptive data for display by the list ROM routine. If data is provided, it may not be in the form shown above.

INTERFACE ACCESS

The Interface Access Panel on the front panel of the 834 allows the user to monitor interface lines or adapt the 834 to nonstandard interface configurations. All twenty-five RS-232 lines enter the access panel. Pins are provided for all lines except Protective Frame Ground. A block diagram of the interface is depicted in Figure 3-15.

Eleven RS-232 lines support full and half duplex data links and synchronous and asynchronous data transmission patterns. These lines are equipped at the access panel with Single Pole-Single Throw (SPST) switches. The operator can use switches and/or jumper wires to:

- Monitor any pin with the marker or probe indicators (see Controls, Indicators, and Connectors section).
- Pull any line high or low with the +V or –V pins.
- Reconfigure the 834 to nonstandard interfaces by connecting or disconnecting primary channel lines with the SPST switches or by crosspatching any of the 24 incoming RS-232 lines to any of the primary channel lines.

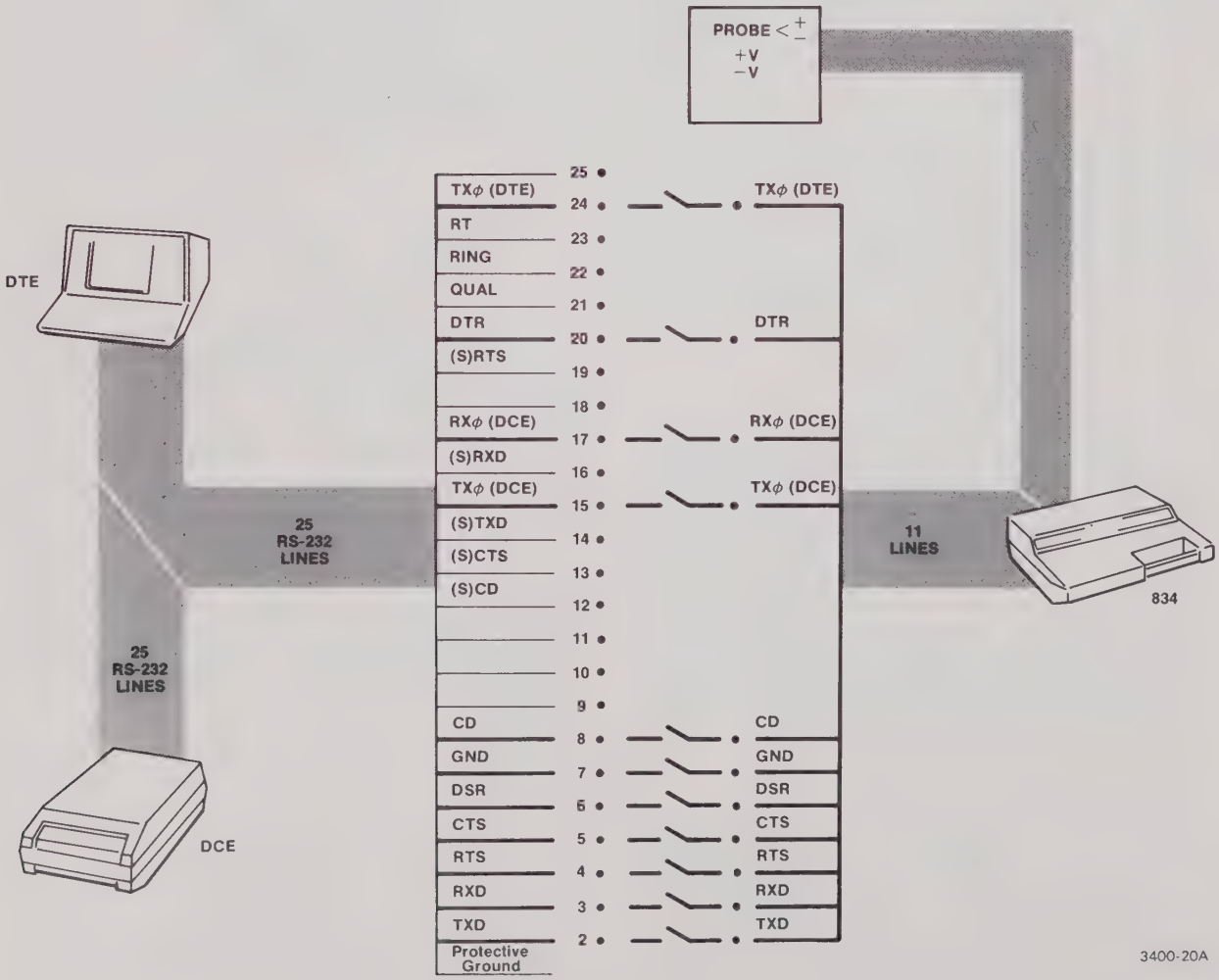


Figure 3-15. Interface Access Block Diagram.

Table 3-2 charts the conditions of the primary channel lines in the Monitor, DCE Simulate, DTE Simulate, and BERT modes.

Figure 3-16 provides background information on the RS-232 format.

Table 3-2

Conditions of Primary Channel Lines by Mode

MODE	PIN/MNEMONIC	DRIVEN/MONITORED	COMMENTS
MONITOR		All M	834 passive to interface
DCE SIM	2/TXD	M	Data from UUT
	3/RXD	D	Data sent by 834
	4/RTS	M	
	5/CTS	D	
	8/CD	D	
	6/DSR	D	Asserted by 834
	20/DTR	M	Must be asserted by UUT or at access panel
	15/TXØ(DCE)	D	DCE transmitted data clock
	17/RXØ	D	Received data clock
	24/TXØ(DTE)	M	DTE transmitted data clock
DTE SIM/BERT	2/TXD	D	Data sent by 834
	3/RXD	M	Data from UUT
	4/RTS	D	
	5/CTS	M	
	8/CD	M	
	6/DSR	M	Must be asserted by UUT or at access panel
	20/DTR	D	Asserted by 834
	15/TXØ(DCE)	M	DCE transmitted data clock
	17/RXØ	M	Received data clock
	24/TXØ(DTE)	D	DTE transmitted data clock

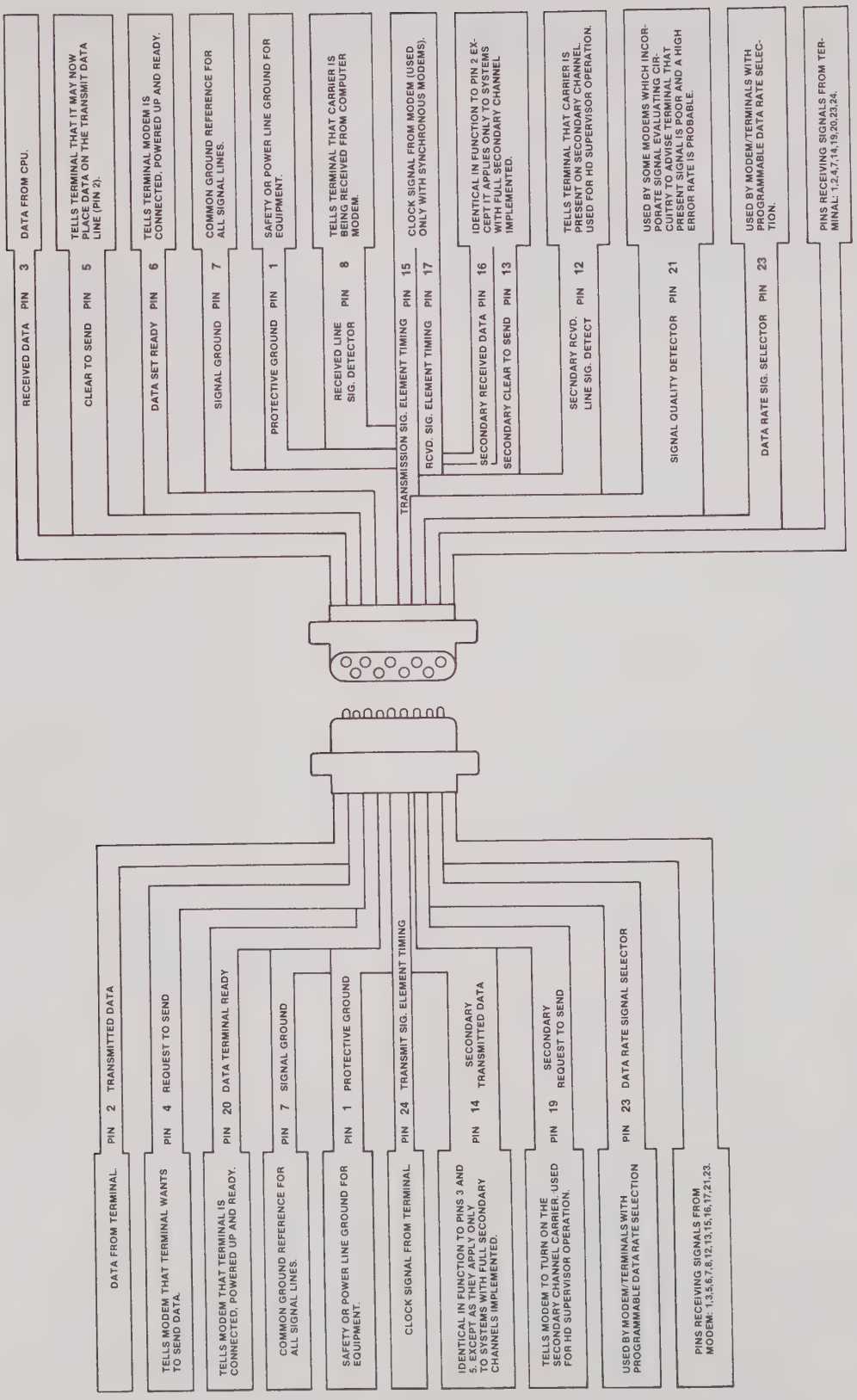

DATA FROM TERMINAL. PIN 2 TRANSMITTED DATA
TELLS MODEM THAT TERMINAL WANTS TO SEND DATA. PIN 4 REQUEST TO SEND
TELLS MODEM THAT TERMINAL IS CONNECTED, POWERED UP AND READY. PIN 20 DATA TERMINAL READY
COMMON GROUND REFERENCE FOR ALL SIGNAL LINES. PIN 7 SIGNAL GROUND
SAFETY OR POWER LINE GROUND FOR EQUIPMENT. PIN 1 PROTECTIVE GROUND
CLOCK SIGNAL FROM TERMINAL PIN 24 TRANSMIT SIG. ELEMENT TIMING
IDENTICAL IN FUNCTION TO PINS 3 AND 5, EXCEPT AS THEY APPLY ONLY TO SYSTEMS WITH FULL SECONDARY CHANNELS IMPLEMENTED. PIN 14 SECONDARY TRANSMITTED DATA
TELLS MODEM TO TURN ON THE SECONDARY CHANNEL CARRIER. USED FOR HD SUPERVISOR OPERATION. PIN 19 SECONDARY REQUEST TO SEND
USED BY MODEM/TERMINALS WITH PROGRAMMABLE DATA RATE SELECTION PIN 23 DATA RATE SIGNAL SELECTOR
PINS RECEIVING SIGNALS FROM MODEM: 1,3,5,6,7,8,12,13,15,16,17,21,23.
RECEIVED DATA PIN 3 DATA FROM CPU.
CLEAR TO SEND PIN 5 TELLS TERMINAL THAT IT MAY NOW PLACE DATA ON THE TRANSMIT DATA LINE (PIN 2).
DATA SET READY PIN 6 TELLS TERMINAL MODEM IS CONNECTED, POWERED UP AND READY.
SIGNAL GROUND PIN 7 COMMON GROUND REFERENCE FOR ALL SIGNAL LINES.
PROTECTIVE GROUND PIN 1 SAFETY OR POWER LINE GROUND FOR EQUIPMENT.
RECEIVED LINE SIG. DETECTOR PIN 8 TELLS TERMINAL THAT CARRIER IS BEING RECEIVED FROM COMPUTER MODEM.
TRANSMISSION SIG. ELEMENT TIMING PIN 15 CLOCK SIGNAL FROM MODEM (USED ONLY WITH SYNCHRONOUS MODEMS).
RCVD. SIG. ELEMENT TIMING PIN 17
SECONDARY RECEIVED DATA PIN 16 IDENTICAL IN FUNCTION TO PIN 2 EXCEPT IT APPLIES ONLY TO SYSTEMS WITH FULL SECONDARY CHANNEL IMPLEMENTED.
SECONDARY CLEAR TO SEND PIN 13
SEC'NDARY RCVD. LINE SIG. DETECT PIN 12 TELLS TERMINAL THAT CARRIER IS PRESENT ON SECONDARY CHANNEL USED FOR HD SUPERVISOR OPERATION.
SIGNAL QUALITY DETECTOR PIN 21 USED BY SOME MODEMS WHICH INCORPORATE SIGNAL EVALUATING CIRCUITRY TO ADVISE TERMINAL THAT PRESENT SIGNAL IS POOR AND A HIGH ERROR RATE IS PROBABLE.
DATA RATE SIG. SELECTOR PIN 23 USED BY MODEM/TERMINALS WITH PROGRAMMABLE DATA RATE SELECTION.
PINS RECEIVING SIGNALS FROM TERMINAL: 1,2,4,7,14,19,20,23,24.
3400-21

Figure 3-16. RS-232 Pin Format.

HALF-DUPLEX LINE TURNAROUND

In half duplex, the following lines are controlled by the 834:

DTE SIM—RTS,DTR
DCE SIM—CD,CTS,DSR

When line conditions change from SEND to RECEIVE state (or vice versa) they remain in that state until another SEND or RECEIVE command is executed.

Pressing PROGRAM while the 834 is operating will display the program status message (see Display Definitions). Program status messages unique to half-duplex operation are presented in parentheses in the description below.

In DTE SIM the 834 performs the half-duplex RS-232 line turnaround as follows (timers may be programmed using the DELAY menu):

1. When a SEND command is executed the 834 waits for CD to go off (SEND WAIT), then raises RTS and waits for CTS to go on SEND DELAY),then transmits the message.

2. When a RECEIVE command is executed, the 834 turns off RTS and waits for the DCE to turn on CD (RECEIVE WAIT).

In DCE SIM the 834 performs the half-duplex RS-232 line turnaround follows (timers may be programmed using the DELAY menu):

1. When a SEND command is executed the 834 waits for RTS to go off (SEND WAIT) then turns on the RTS/CD timer (SEND DELAY). When the the timer expires, the 834 turns on CD and transmits the message.

2. When a RECEIVE command is executed, the tester waits for RTS to go on (RECEIVE WAIT), then starts the RTS/CTS timer (RECEIVE DELAY). When the timer expires the 834 raises CTS.

FRAMES

In MONITOR MODE framing is useful because:

1. The 834 inserts EOF indicators][into the capture buffer when it encounters an end-of-frame condition. This makes end-of-frame conditions more visible when reading the capture buffer.

2. Masked triggering is always based on start-of-frame. Without frames, the user can only do a sliding search of the received data.

In SIMULATE modes (DTE and DCE) frames are essential since the 834 requires that a frame of data be received before a RECEIVE command can be executed.

Synchronous

A start-of-frame is recognized by the 834 as the first non-SYN character after synchronization is established.

An end-of-frame is recognized by the 834 as an EOF character or idle line. An idle line consists of a series of SYN characters, SPACES (all zeros), or MARKS (all 1's). The number and type of characters which determine an idle line may be selected by the "IDLE=" menu. See the SETUP section of this manual.

HDLC

Start- and end-of-frame are defined by protocol.

Asynchronous

Start-of-frame is recognized by the 834 as the first character received after an end-of-frame is found.

An end-of-frame is recognized when the 834 encounters an EOF character. (An EOF is defined in the SETUP section of this manual.)

ASYNBLK

A start-of-frame is recognized by the 834 as the first character received after an end-of-frame.

An end-of-frame consists of a number of character times within which no valid characters were received. The number of character times is selected by the "IDLE=" menu. See the SETUP section of this manual.

DISPLAY DEFINITIONS

The following messages appear in the 834's display area during various stages of the tester's operation.

834 MALFUNCTION. Indicates an error in the 834 microprocessor. The user should send the 834 to a qualified service person, if removing user-generated ROM's does not eliminate the problem.

834 STOPPED. The 834 mode switch has been turned or STOP has been pressed.

ACQUIRE. (Program Status) This is the start of the realtime data display. Usually this message will leave the screen as characters are sent or received. If this display remains, check the setups and clocks. In SYNC setup check the NO SYN light to see if synchronization has been established.

BERT TEST DONE. The 834 has completed a finite length BERT test.

CS OK. This message precedes 834 READY. When CS OK remains on the screen, it indicates that the 834 passed all power up tests but was unable to initialize the system. This message may indicate a bad user ROM; if removing the user-generated ROM does not fix the problem, send to a qualified service person.

DS OK. This message precedes 834 READY. When DS OK remains on the screen, it indicates a hardware malfunction. (Send the 834 to a qualified service person.)

ERROR TRIG FOUND. (Trigger Status Message) An ERROR trigger has been found.

ERROR TRIGGER. (Termination Message) An ERROR trigger has been found.

EXTRA FRAME. The 834 checks to see if frames have been received while sending data. To disable this function, press 14 TRANSFER. To reenable this function, press 15 TRANSFER.

FRAME OVERRUN. (Termination Message) The 834 has received more than two full frames and has not executed a RECEIVE command.

HALT AT STEP 100. (Termination Message) Program Step 99 has been executed and the next step is step 100, which does not exist. The 834 stops and displays =HALT AT STEP 100.

HALT AT STEP nn. 834 has encountered a HALT instruction for which no message buffer has been specified. Where nn is the step number.

MARKER TRIG FOUND. (Trigger Status Message) A MARKER trigger has been found.

MARKER TRIGGER. (Termination Message) A MARKER trigger has been found.

MATCH TRIG FOUND. (Trigger Status Message) A data trigger has been found.

STRING TRIGGER. (Termination Message) Character string match trigger has been found.

NO SUCH XFER#. Keystroke sequence to be transferred does not exist.

NO TRIG FOUND. (Trigger Status Message) A trigger has been specified but not found.

NO TRIG SET. No trigger is specified, or a data trigger is specified but no data path (DTE or DCE) is selected.

PRESS SETUP? 834 is in an idle condition. Operator must choose which display he wants: SETUP, PROGRAM/TRIGGER, or DATA. Only other functions allowable are transfer functions and START.

ssRECEIVE. The 834 is executing a RECEIVE command.

(Program Status) The 834 has completed the necessary line-turnaround (if in half-duplex) and is waiting for a valid frame to be received.

RECEIVE DELAY. RTS is ON, but 834 is waiting for specified line turnaround time to expire before it can raise CTS.

RECEIVE WAIT. The 834 is executing a RECEIVE command.

DTE SIM. 834 turns off RTS, waits for CD to go high.

RCV OVERRUN. The baud rate in the combination with certain setup parameters (e.g., sync/async, full or half-duplex) exceeds the ability of the 834 to process incoming data*.

ssSEND DELAY. The 834 is executing a SEND command.

DTE SIM (half duplex). 834 raises RTS, waits for CTS to go ON.

DCE SIM (half-duplex). RTS has been dropped and the 834 is waiting the specified line turnaround delay time to expire before it can raise CD.

ssRUNNING. The 834 is executing a program. Usually this message appears when the simulation program is in a loop.

ssSEND HOLD. The 834 is executing a SEND command.

DTE SIM. The 834 is waiting for DSR to go high.

DCE SIM. The 834 is waiting for DTR to go ON.

In synchronous and HDLC, the 834 only checks DSR and DTR at the beginning of the frame. In asynchronous, the 834 checks DTR and DSR line status for each character.

ssSENDING. 834 is executing a SEND command. The 834 has completed all line turnaround functions (if in half-duplex) and data is being sent. If the 834 expects an external clock and sees none, the 834 will display SENDING but no data will be sent.

SEND WAIT. The 834 is executing a SEND command.

DTE SIM. In half-duplex only, the 834 waits for modem to drop CD.

DCE SIM. In half-duplex only, the 834 waits for DTE to drop RTS.

SETUP ERROR. Parity and bits/char are in contention: 5 bits/char with parity (unallowable); or 9 bits/char without parity (unallowable).

TOO MANY XFERS. A User ROM programming error. More than five transfer functions have been nested. This will occur if a keystroke sequence invokes itself.

ssWAITING. (Program Status) The 834 is executing a "WAIT" instruction.

***To remedy the situation of a RCV OVERRUN perform the following operations:**

In any setup—turn off the MARKER trigger; turn off the error trigger; turn off the MATCH trigger; turn off the realtime display (12 transfer on, 13 transfer off).

In async—select the proper parity and bits/char; clear the EOF character.

In sync—select proper parity; choose a specific idle charcter; clear the EOF character.

ADDITIONAL OPERATING INFORMATION

Table 3-3
Hex-ASCII Conversion Chart

HIGH \ LOW $B_4B_3B_2B_1$		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
$B_8B_7B_6B_5$		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
0001	1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
0010	2	SP	!	"	#	$	%	&	'	(	)	*	+	,	—	.	/
0011	3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
0100	4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0101	5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	—
0110	6	\	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
0111	7	p	q	r	s	t	u	v	w	x	y	z	'	l	~	~	DEL

BINARY — HEX — ASCII

Table 3-4
Hex-EBCDIC Conversion Chart

HIGH \ LOW $B_4B_3B_2B_1$		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
$B_8B_7B_6B_5$		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL	SOH	STX	ETX	PF	HT	LC	DEL		RLF	SMM	VT	FF	CR	SC	SI
0001	1	DLE	DC1	DC2	DC3	RES	NL	BS	IL	CAN	EM	CC		ITS	IGS	IRS	IUS
0010	2	DS	SOS	FS		BYP	LF	EOB/ ETB	ESC/ PRE			3M			ENR	ACK	BEL
0011	3			SYN		PN	RS	UC	EOT					DC4	NAK		SUB
0100	4	SP										¢	•	<	(	+	|
0101	5	&										!	$	#	)	;	¬
0110	6	–	/								/	|	,	%	—	>	?
0111	7											:	#	@	'	=	"
1000	8		a	b	c	d	e	f	g	h	i						
1001	9		j	k	l	m	n	o	p	q	r						
1010	A			s	t	u	v	w	x	y	z						
1011	B																
1100	C		A	B	C	D	E	F	G	H	I						
1101	D		J	k	l	m	n	o	p	Q	R						
1110	E			S	T	U	V	W	X	Y	Z						
1111	F	0	1	2	3	4	5	6	7	8	9						

BINARY — HEX — EBCDIC

Table 3-5

834 ASCII CONTROL SYMBOLS

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
2																
7																

Table 3-6

834 EBCDIC CONTROL SYMBOLS

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	SOH	STX	ETX		HT						VT	FF	CR	SO	SI
1	DLE	DC1	DC2	DC3			BS		CAN	EM				GS		US
2			FS			LF	ETB	ESC						ENQ	ACK	BEL
3			SYN			RS		EOT					DC4	NAK		SUB
4																

Table 3-7

834 SYMBOLS, ASCII and EBCDIC CONTROL MNEMONICS and HEX CODE

SYMBOL	MNEMONIC	DEFINITION	ASCII CODE	EBCDIC CODE
	NUL	NULL	00	00
	SOH	START OF HEADER	01	01
	STX	START OF TEXT	02	02
	ETX	END OF TEXT	03	03
	EOT	END OF TRANSMISSION	04	37
	ENQ	ENQUIRE	05	2D
	ACK	ACKNOWLEDGE	06	2E
	BEL	BELL	07	2F
	BS	BACK SPACE	08	16
	HT	HORIZONTAL TAB	09	05
	LF	LINE FEED	0A	25
	VT	VERTICAL TAB	0B	0B
	FF	FORM FEED	0C	0C
	CR	CARRIAGE RETURN	0D	0D
	SO	SHIFT OUT	0E	0E
	SI	SHIFT IN	0F	0F
	DLE	DATA LINK ESCAPE	10	10
	DC1	DEVICE CONTROL 1	11	11
	DC2	DEVICE CONTROL 2	12	12
	DC3	DEVICE CONTROL 3	13	13
	DC4	DEVICE CONTROL 4	14	3C
	NAK	NEGATIVE ACKNOWLEDGMENT	15	3D
	SYN	SYNCHRONIZE	16	32
	ETB	END OF TEXT BLOCK	17	26
	CAN	CANCEL	18	18
	EM	END OF MEDIA	19	19
	SUB	SUBSTITUTE	1A	3F
	ESC	ESCAPE	1B	27
	FS	FRAME SEPARATOR	1C	22
	GS	GROUP SEPARATOR	1D	1D
	RS	RECORD SEPARATOR	1E	35
	US	UNIT SEPARATOR	1F	1F
	(SP)[a]	SPACE	20	40
	(DEL)[a]	DELETE	7F	07
	—	UNDEFINED CHARACTER	—	—
	—	MARKING LINE (EBCDIC ONLY)	—	FF
	EOF	END OF FRAME [b] (INSERTED BY 834)	—	—
	—	MARKER FALLING EDGE[c]	—	—
	—	MARKER RISING EDGE [c]	—	—

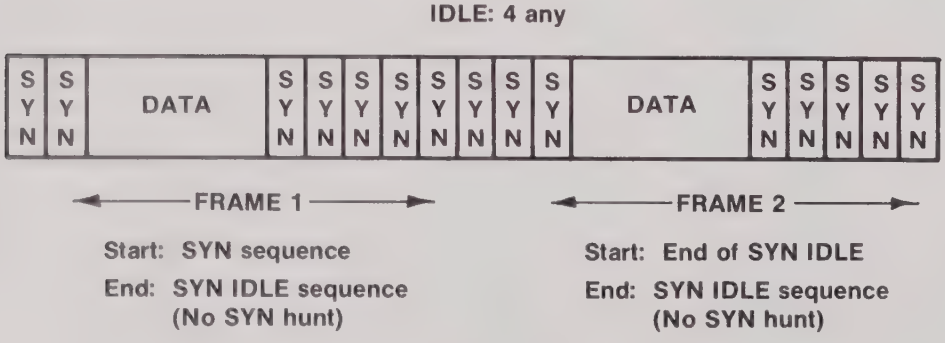
[a] Does not appear on 834 display [b] See FRAMING section [c] See TRIGGER section

Table 3-8

SIMULATION CLOCKING

	DTE			DCE		
	PIN 15 TX0 (DCE)	PIN 17 RX0 (DCE)	PIN 24 TX0 (DTE) DRIVEN BY 834	PIN 15 TX0 (DCE) DRIVEN BY 834	PIN 17 RX0 (DCE) DRIVEN BY 834	PIN 24 TX0 (DTE)
ASYNC						
NORMAL	—	—	G, S, (16X)	G, I (16X)	G, S,(16X)	—
ISOCH	S	I	M	G, I	G, S	—
SYNC						
NORMAL	S	I	M	G, I	G, S	—
+ DERIVED	—	—	G, S	D, I	G, S	—
DTE	—	I	G, S	M	G, S	I
HDLC						
NORMAL	S	I	M	G, I	G, S	—
+ DERIVED/NRZI*	—	—	G, S	D, I	G, S	—
DTE	—	I	G, S	M	G, S	I
	I — INPUTED DATA CLOCK (RS—232 RECEIVED DATA) S — SEND DATA CLOCK (RS—232 TRANSMITTED DATA)			I — INPUTED DATA CLOCK (RS—232 TRANSMITTED DATA) S — SEND DATA CLOCK (RS—232 RECEIVED DATA) D — CLOCK DERIVED FROM DATA (RXD PIN 3)		

* NRZI USES A DERIVED CLOCK REGARDLESS OF CLOCK SELECTION
\+ BAUD RATE MUST BE COMPATIBLE WITH SYSTEM UNDER TEST
G — 834 INTERNALLY GENERATED CLOCK
M — LINE DRIVEN TO MARK
— — NOT USED



When four of any SYN character are specified as the idle character, the 834 looks for an occurrence of the SYN sequence before synchronizing for the first frame of data. After the frame is received and the 834 establishes a line idle condition (the 834 sees four SYN characters in a row), it recognizes the start of the next frame as the first non-SYN character.

Figure 3-17. 834 Sync Slew.

Table 3-9

SETUP KEY SEQUENCES FOR MONITOR, DCE SIM, AND DTE SIM MODES

		0 →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	CODE	EBCDIC	EBCDIC$_{hx}$	ASCII	ASCII$_{hx}$	HEX											
1	BAUD	1200	1800	2400	3600	4800	7200	9600	19200	50	75	110	134.5	150	200	300	600
2	DUPLEX	FULL	HALF	FULL-I[a]	HALF-I[a]												
3	DELAY	200 (selectable from keypad)															
4	SETUP	SYNC	HDLC	ASYNC	ASYNBLK												

[a] Option 4 instruments only

SYNC

		0 →	1	2	3	4
1	BITS/CHR	8	5	6	7	
2	PARITY	NONE	ODD	EVEN	MARK	SPACE
3	BCC	CRC-16	LRC			
4	SYN	3232 (selectable from keypad)				
5	EOF	37 (selectable from keypad)				
6	IDLE	4	8	8 MARK	8 SPACE	8 SYN
7	CLK	NORMAL	DERIVED	DTE		

HDLC

		0 →	1	2
1	NRZI (NRZ[a])	OFF	ON	
2	CLK	NORMAL	DERIVED	DTE

[a] Option 4 instruments only

ASYNC & ASYNBLK[b]

		0 →	1	2	3	4
1	BITS/CHR	8	9	5	6	7
2	PARITY	NONE	ODD	EVEN	MARK	SPACE
3	STOPBITS	1	1.5	2		
4	EOF	0A (selectable from keypad)				
5	TIMING	NORMAL	ISOCH			

[b] BCC and IDLE selections for ASYNBLK must be accessed via SYNC.

Table 3-10

SETUP KEY SEQUENCES FOR BERT MODE

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	BAUD	1200	1800	2400	3600	4800	7200	9600	19200	50	75	110	134.5	150	200	300	600
1	PATTERN	511															
2	BITS	CONT(-INV[a])	10E5 (-INV[a])	10E6 (-INV[a])													
3	SETUP		ASYNC														

[a]Option 4 instruments only.

SYNC

		0	1	2
1	CLK	NORMAL	DERIVED	DTE

ASYNC →

		0	1	2	3	4
1	BITS/CHR	8	9	5	6	7
2	PARITY	NONE	ODD	EVEN	MARK	SPACE
3	STOPBITS	1	1.5	2		

Table 3-11

TRIGGER KEY SEQUENCES

		→ 0	1	2
0	NO TRIG SET			
1	POS @ END	END	START	CENTER
2	MATCH	NONE	DCE	DTE
3	T:	(enter from keypad)		
4	M:	(enter from keypad)		
5	ERROR	OFF	ON	
6	MARKER	NONE	⌠	⌡

Table 3-12

SIMULATION PROGRAMMING KEY SEQUENCES

	1	2	3	4	5	6	7	8	9	10
0	PROGRAM STEPS	MESSAGE:####	PARAMETERS							
1	HALT :0	SEND :0	RECEIVE	COMPARE: 0	JUMP EQ-0	JUMP NE-0	JUMP-0	IF TIME-0	TIMEOUT# 0	MASK :0	WAIT # 0
2	HALT :0	SEND :0	RECEIVE	COMPARE: 0	JUMP EQ-0	JUMP NE-0	JUMP-0	IF TIME-0	TIMEOUT# 0	MASK :0	WAIT # 0
99	HALT 0	SEND :0	RECEIVE	COMPARE: 0	JUMP EQ-0	JUMP NE-0	JUMP-0	IF TIME-0	TIMEOUT# 0	MASK :0	WAIT # 0

MESSAGES

	0
1	1M: (enter from keypad)
2	2M: (enter from keypad)
50	50M: (enter from keypad)

PARAMETERS

	0
1	1P=0 (selectable from keypad)
2	2P=0 (selectable from keypad)
50	50P=0 (selectable from keypad)

Table 3-13
834 BASIC INSTRUCTION SET

Instr. Number	Instruction			Description
0	HALT	:	mm	Halt program execution and display message mm.
1	SEND	:	mm	Transmit contents of message mm as a single frame.
2	RECEIVE			Obtain next complete data frame for processing.
3	COMPARE	:	mm	Search current frame in capture buffer for character sequence contained in message mm; if found, flag = EQ, else NE.
4	JUMP EQ	→	ss	If flag = EQ, jump to program step ss.
5	JUMP NE	→	ss	If flag = NE, jump to program step ss.
6	JUMP	→	ss	Jump to program step ss.
7	IF TIME	→	ss	If TIMEOUT# timer expires, jump to program step ss.
8	TIMEOUT	#	pp	Start internal timer for number of milliseconds in parameter pp.
9	MASK	:	mm	Mask character(s) in current frame of capture buffer according to message mm; used with COMPARE.
10	WAIT	#	pp	Stop program execution for number of milliseconds specified in parameter pp.

OPTIONS

OPTION 2-CURRENT LOOP INTERFACE ADAPTER

When purchased with the 834, the Current Loop Interface Adapter (015-0361-00) is Option 2. When purchased separately, the Adapter is considered an accessory. Information on this unit can be found in the Current Loop Interface Adapter Manual (070-2963-00).

OPTION 4-MIL-STD-188C INTERFACE

Operator's Information

The Option 4 is a variation of the 834 Programmable Data Communications Tester to conform to the Military Communication System Technical Standard MIL-STD-188C interface in addition to the RS-232-C interface.

The 834 Option 4 is fully functional with RS-232 as well as MIL-STD-188C interfaces. Because of this compatibility, this section discusses only those factors that are different from those previously discussed in this manual.

The differences between the MIL-STD-188C and RS-232 interfaces are: 1) -V indicates a Space (low logic condition) and +V indicates a Mark (high logic condition) for MIL-STD-188C; therefore, data passed over a MIL-STD-188C interface is inverted in relation to the same data passed over a RS-232 interface. 2) MIL-STD-188C requires different electrical specifications. Physical and environmental specifications are unchanged. Refer to Table 3-16 for the 834 Option 4 electrical specifications that are different from those listed in Section 2 for the basic 834.

Operation of the 834 Option 4 is unchanged from that documented in previous sections of this manual with the following exceptions:

1. The setup menu selections available under DUPLEX are expanded to allow for selection of data inversion:

   DUPLEX = FULL, HALF, FULL-I, HALF-I

   The definitions of FULL and HALF DUPLEX are unchanged. FULL-I indicates full-duplex operation with inverted data. HALF-I indicates half-duplex operation with inverted data. The DUPLEX default selection is FULL.

   The expanded DUPLEX menu appears in the setup conditions for DTE SIM, DCE SIM, MONITOR, and BERT modes.

2. If FULL-I or HALF-I is selected, the NRZI = OFF, ON (Non-Return to Zero Inverted) item in the HDLC setup is changed to NRZ = OFF, ON.
3. If FULL-I or HALF-I is selected, the "BITS =" setup condition in BERT mode displays "-INV" in addition to the normal values (CONT-INV, 10E5-INV, 10E6-INV) to indicate that inverted data is in effect.

Table 3-14

834 OPTION 4 ELECTRICAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
INTERFACE CONNECTOR (J316)—MONITOR MODE		
Inputs Pin 2 Transmitted data 3 Received data 4 Request to send 5 Clear to send 8 Data carrier detect 15 Transmission signal element timing (DCE source) 17 Receiver signal element timing (DCE source) 24 Transmit signal element (DTE source)		-V or OFF: —25 V ≤ Vin ≤ -200 mV +V or ON: +200 mV ≤ Vin ≤ +25 V Rin ≥ 6.0 kΩ
6 Data set ready 20 Data terminal ready		-V or OFF: -15 ≤ Vin ≤ +0.5V +V or ON: +15 V ≥ Vin ≥ +0.8 V Rin ≥ 15 kΩ
Outputs None		
Other Pin 1 Ground 7 Signal ground 9-14, 16, 18, 19, 21-23, 25		Not used Connected to the instrument ground. Connected only to pins on the Interface Access Panel.

Table 3-14 (cont)

834 OPTION 4 ELECTRICAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
INTERFACE CONNECTOR (J316)—DCE SIMULATE MODE		
Inputs Pin 4 Request to send 24 Transmit signal element timing (DTE source)		-V or OFF: -25 V ≤ Vin ≤ -200 mV. +V or ON: +200 mV ≤ Vin ≤ +25 V Rin ≥ 6.0 kΩ.
20 Data terminal ready		-V or OFF: -15 V ≤ Vin ≤ +0.5 V +V or ON: +15 V≥ Vin ≥ +0.8 V Rin ≥ 15 kΩ.
Outputs Pin 3 Received data 5 Clear to send 6 Data set ready 8 Data carrier detect 15 Transmission signal element timing (DCE source) 17 Receiver signal element timing (DCE source)		-V or OFF: -7 V ≤ Vout ≤ -5 V. +V or ON: +7 V ≥Vout ≥ +5 V. Load impedance: R_L ≥ 450 Ω.
Other Pin 1 Ground 7 Signal ground 9-14, 16, 18, 19, 21-23, 25		Not used Connected to the instrument ground. Connected only to pins on the Interface Access Panel.

Table 3-14 (cont)

834 OPTION 4 ELECTRICAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
INTERFACE CONNECTOR (J316)—DTE SIMULATE AND BERT MODES		
Inputs Pins 3 Received data 5 Clear to send 8 Data carrier detect 15 Transmission signal element timing (DCE source) 17 Receiver signal element timing (DCE source)		-V or OFF: -25 V ≤ Vin ≤ -200 mV. +V or ON: +200 mV ≤ Vin ≤ +25 V. Rin ≥ 6.0 kΩ.
6 Data set ready		-V or OFF: -15 V ≤ Vin ≤ +0.5 V. +V or ON: +15 V ≥ Vin ≥ +0.8 V. Rin ≥ 15 kΩ.
Outputs Pin 2 Transmitted data 4 Request to send 20 Data terminal ready 24 Transmit signal element		-V or OFF: -7 V ≤ Vout ≤ -5 V. +V or ON: +7 V ≥ Vout ≥ +5 V. Load impedance: R_L ≥ 450 Ω.
Other Pin 1 Ground 7 Signal ground 9-14, 16, 18, 19, 21-23, 25		Not used. Connected to the instrument ground. Connected only to pins on the Interface Access Panel.

Table 3-14 (cont)

834 OPTION 4 ELECTRICAL SPECIFICATIONS

Characteristic	Performance Requirement	Supplemental Information
INTERFACE ACCESS PANEL		
Probe +		+3 V ≤ Vin ≤ +25 V.
-		-25 V ≤ Vin ≤ -3 V. Rin ≥ 50 kΩ.
Marker		-V or OFF: -15 V ≤ Vin ≤ +0.5 V +V or ON: +15 V ≥ Vin ≥ +0.8 V.
+V Source		Rin ≥ 15 kΩ. +5.7 V ±0.5 V (no load) Output impedance: approx. 300 Ω (each pin)
-V Source		-5.7 V ±0.5 V (no load). Output Impedance: Approximately 300 Ω (each pin).
POWER REQUIREMENTS		
Line Voltage Ranges 115 V 230 V	 90 to 132 V 180 to 250 V	
Line Frequency Range	48 to 440 Hz.	
Power Consumption	Approx. 30 watt	

APPENDIX A

834 ROM CODING

MANUAL ROM CODING

Coding A Custom XROM

Custom XROM's for the Tektronix 834 Programmable Data Communications Tester make readily available frequently used setup information, simulation programs, and user messages. The code stored in an XROM can initiate any of the key functions on the 834's front panel. In addition, the XROM code allows you to expand the instrument's setups and menu options or to include user-defined translation codes, baud rates, and idle definitions.

This section describes how to code your own XROM. Use only ROM's identified by the vendor part number 2716, 2732, or 2532. The fourth socket (XROM 3) of all 834 ROM Packs is reserved for the custom XROM.

All information in an 834 custom XROM must be entered in hexadecimal notation (base-16 number system). To code a custom XROM, you should be familiar with hexadecimal notation (base-16 number system).

Depending upon the type of XROM used the fourth socket has to be jumpered in the following manner:

Part	P3 Jumpers
2716 or TMS 2516	1-2, 4-5
2532	2-3; 4-5
2732	1-2, 3-4

CAUTION

XROM's should be installed in a ROM Pack only by qualified service personnel.

The Custom XROM Format

A custom XROM has three sections: the header, the ROM list, and the trailer (Figure A-1). The sections, outlined below, are detailed in the CODING PROCEDURE subsection.

The Header

The header occupies the first 32 bytes of the custom XROM (Figure A-2). Byte 0 of the header, the physical start of the XROM, contains either 55h or FFh. Standard 834 XROM's contain 55h in the first byte of the header, indicating that all the information in the XROM agrees with the conventional format. An FFh on the first byte, offered as a convenience for coding custom XROM's, directs the 834 to ignore the XROM length field (bytes 1 and 2 of the header) and the checksum field (the last two bytes of the trailer). Enter FFh in the first byte of the header if you do not wish to include a checksum for the custom XROM or on XROM length.

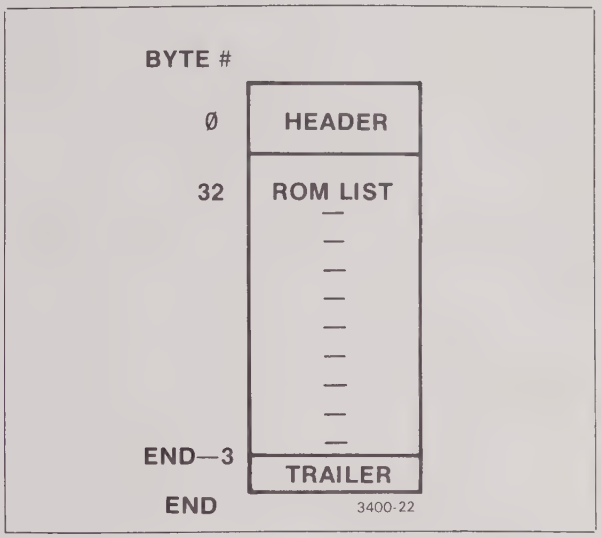


Figure A-1. Custom ROM format.

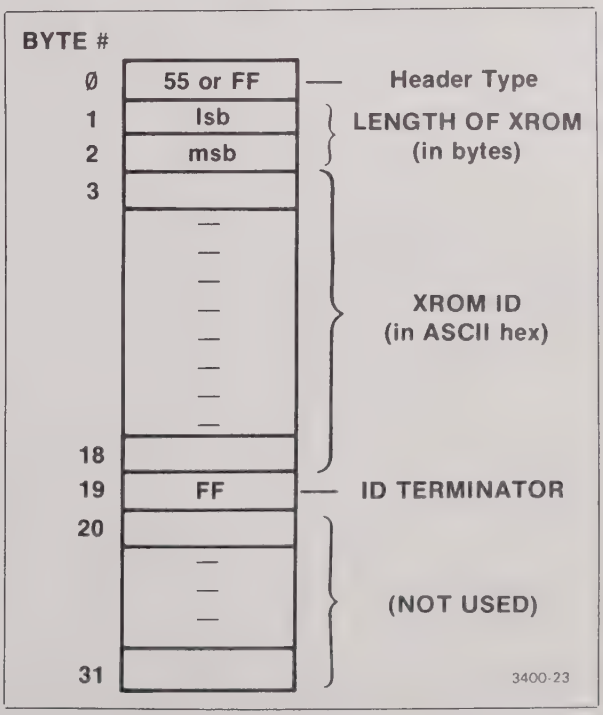


Figure A-2. The XROM header format.

The second and third bytes of the header contain the length of the entire XROM in bytes, the least significant (lsb) of the length in byte 1 and the most significant byte (msb) of the length in byte 2. For example, if the XROM length is 4 K bytes (4096 bytes), first convert the decimal length to hexadecimal notation, then enter the result (1000h) into the XROM as follows:

Byte #	
1	00
2	10

Bytes 3 through 18 of the header contain a 16-character XROM ID. The ID serves to identify the contents of the custom XROM to an 834 operator. Translate the alphanumeric characters in the ID to ASCII hex code before entering them in the XROM. If the ID is less than 16 characters in length, fill the remaining bytes with spaces. (The ASCII code for a SPACE character is 20h.) Byte 19 in the header, always FFh, indicates the end of the XROM ID.

To display the XROM ID on the 834's front panel, first switch the instrument to SELF TEST, then press the DOWN key twice. Now press the keys 0, RIGHT, 8, RIGHT so that the message LIST-XROM3 is displayed. Finally, press the START key to display the custom XROM ID. If no XROM is installed, the message NO XROM HEADER is displayed.

If an XROM is installed, a 16-character message is displayed. Bytes 20 through 31 of the header are ignored by the 834.

The ROM List

The ROM list consists of one or more entries of varying lengths. The entries in the ROM list are an extension of the 834's firmware. Plugging a ROM Pack into the 834 automatically links the ROM list entries in each of the XROM's with the instrument's resident ROM List.

There are three basic types of ROM List entries: key sequence entries, menu entries, and directory entries. Key sequence entries consist of a sequence of hexadecimal codes that correspond to the keys on the 834's front panel. The function of a key code in the ROM list is equivalent to pressing a front-panel key. In addition, the key codes include a few functions that are not available on the 834's front panel.

Menu entries allow you to add user-defined translation codes, baud rates, and sync idle characters to the existing setup menu options. Directory entries offer a menu to identify the individual key sequence entries in an XROM by displaying a brief description of each entry on the 834's front panel.

The Trailer

The trailer occupies the last six bytes of the custom XROM (Figure A-3). The last two bytes of the trailer contain the checksum for the entire XROM, the least significant byte (lsb) of the checksum in byte END (the physical end of the XROM) and the most significant byte (msb) of the checksum in byte END-1. The procedure for calculating the checksum is described in THE CODING PROCEDURE.

The four bytes above the checksum bytes END-5 through END-2 of the custom XROM trailer, must always contain respectively, 00h, 00h, 00h and FFh.

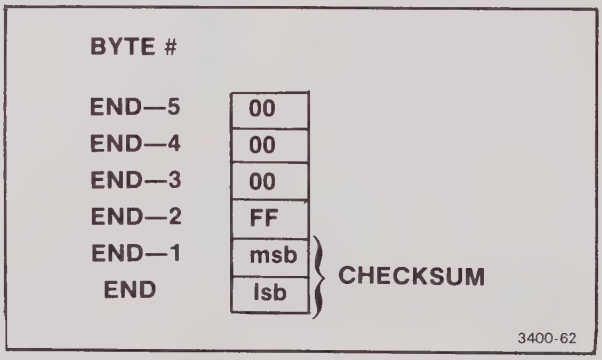


Figure A-3. The XROM trailer format.

The Coding Procedure

Coding a custom XROM is basically a three-step process (Figure A-4). Before starting the coding procedure, you should have a clear idea of the 834 application for which you're producing the custom XROM. For the first step of the procedure, select the setup options for the application and write the necessary simulation programs. The second step consists of coding the ROM list into key sequence entries. All desired menu and directory entries are also coded during this stage. For the third step, code the XROM header and trailer, then, in accordance with the custom XROM format, combine them with the ROM list entries' ROM image. The ROM image is used to generate the custom XROM.

The following information guides you through the coding procedure. Word sheets and coding forms are provided to help make the process a little easier.

The First Step: Setups and Simulation Programs

The first step of the custom XROM coding procedure involves selecting the data communications network setup option for the 834 application and writing the necessary simulation programs.

Selecting The Setup Option

If the 834 application is to run on only one data communication network or on several networks with common setup options, it is convenient to include the setup options in the custom XROM. Then the 834 operator does not have to repeatedly key the same setup information before running the application.

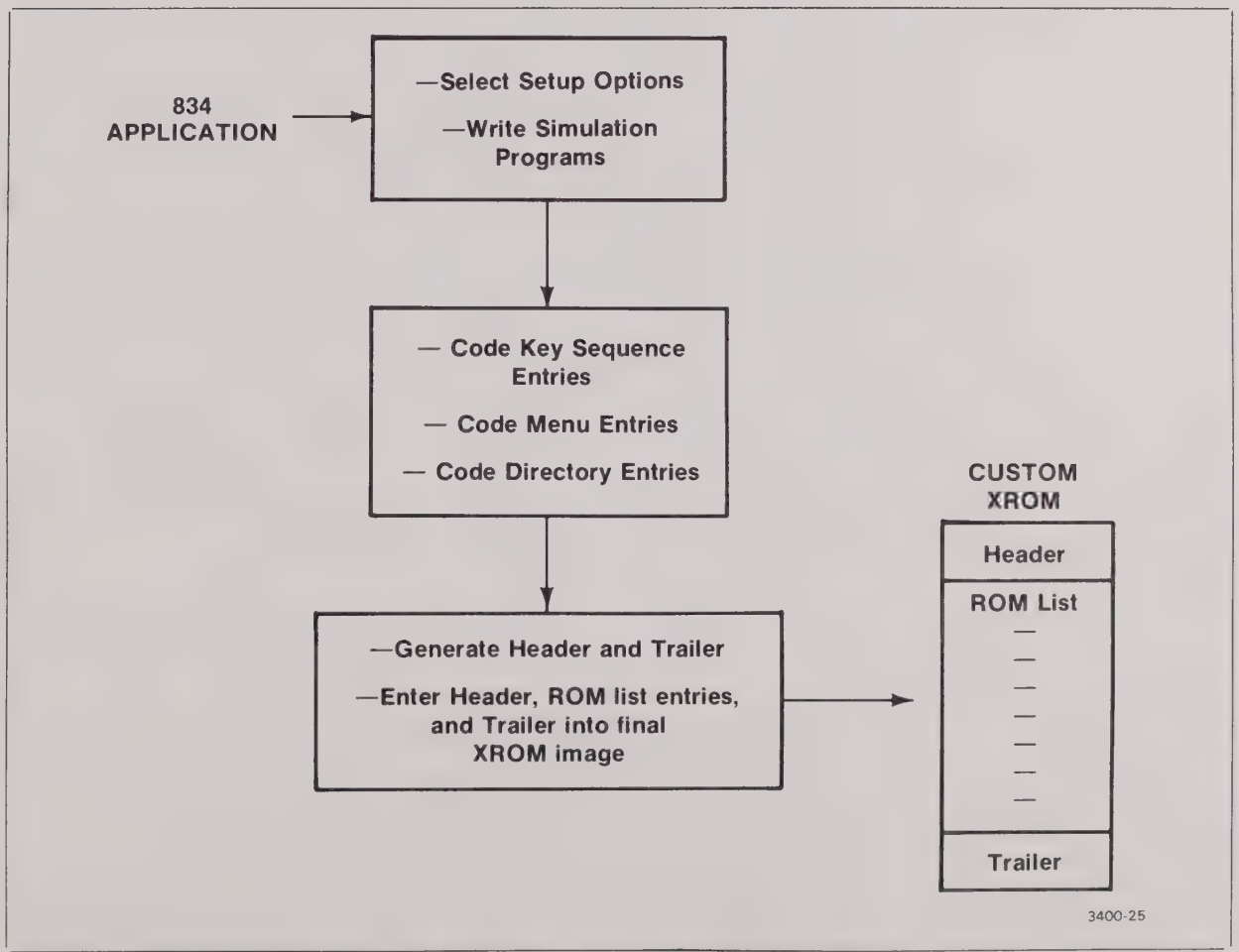


Figure A-4. The three steps in the custom XROM coding procedure.

The Setup Worksheet in Figure A-5 lists menu information for each of the 834's operating modes. The top of the worksheet provides space for the date, page number, programmer, ROM name, and a brief description of the setup informaiton. The abbreviation XFR# in the upper right corner of the worksheet refers to the transfer number, which is explained later in this section.

The first box on the worksheet lists the setup menu categories for the Monitor and DCE/DTE Simulation Modes, the second box lists the categories for the BERT Mode, and the third box lists the menu categories for trigger programs. The fourth box is for comments, generally further information for the 834 operator who runs the application.

To use the setup worksheet, just write in the desired setup option next to each menu category. Figure A-6 shows a sample setup worksheet. Note that setup options for the baud rate and duplex menu categories are not included in the custom XROM. For this sample application, the baud rate and duplex are variable. The worksheet comments section instructs the operator to key in the baud rate and duplex options of the 834's front panel before running the application.

Writing the Simulation Programs

Storing a simulation program in the custom XROM, especially a frequently used program, saves the time involved in entering the program on the 834's front panel. The worksheet in Figure A-7 provides space to list the program steps, message, and parameters of your simulation program.

The section labeled PROGRAM STEP on the Simulation Programming Worksheet is divided into three columns: the first column for the program step number, the second for the name of the instruction, and the third for the cross-reference (XREF) number. Depending on the instruction, the cross-reference number refers either to a message, a parameter, or to another program step.

834 SETUP WORKSHEET
Form SW-1

DATE _____ PAGE _____ OF _____
PAGE _____ OF XFR# _____
PROGRAMMER _____
ROM NAME _____

Description

SIMULATE/MONITOR MODE SETUP:

MODE _____

CODE
BAUD
DUPLEX
DELAY

SETUP	SYNC	HDLC	ASYNC/ASYNBLK*
	Bits/char	NRZI	Bits/Char
	Parity	Clock	Parity
	BCC*		Stop Bits
	SYN		EOF
	EOF		Timing
	IDLE*		
	Clock		

*BCC and IDLE in SYNC menu must be set with ASYNBLK

BERT MODE SETUP:

BAUD
PATTERN
BITS

SETUP	SYNC	ASYNC
	Clock	Bits/Char
		Parity
		Stop Bits

TRIGGER PROGRAMS:

POS@
MATCH
T _____
M _____
ERROR
MARKER

OTHER SETUPS:

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Figure A-5. The Setup Worksheet.

834 SETUP WORKSHEET
Form SW-1

DATE _____ PAGE _____ OF _____
PAGE _____ OF XFR# _____
PROGRAMMER _____
ROM NAME _____

Description

SIMULATE/MONITOR MODE SETUP:

MODE: OCESIM

CODE = ASCII
BAUD
DUPLEX
DELAY

SETUP = ASYNC	SYNC	HDLC	ASYNC/ASYNBLK*
	Bits/char	NRZI	Bits/Char = 8
	Parity	Clock	Parity = NONE
	BCC*		Stop Bits = 1
	SYN		EOF = ØD
	EOF		Timing
	IDLE*		
	Clock		

*BCC and IDLE in SYNC menu must be set with ASYNBLK

BERT MODE SETUP:

BAUD
PATTERN
BITS

SETUP	SYNC	ASYNC
	Clock	Bits/Char
		Parity
		Stop Bits

TRIGGER PROGRAMS:

POS@
MATCH
T _____
M _____
ERROR
MARKER

OTHER SETUPS:

SET THE OPERATING MODE SWITCH TO OCESIM
KEY IN CORRECT BAUD RATE AND DUPLEX

3400-27

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Figure A-6. A sample Setup Worksheet.

The MESSAGES section on the worksheet provides a column for the message number and a column for the message. Since a message can be up to 3000 characters in length, we recommend that you write only a brief description of or reference to the message in the space provided. You can write the entire message in a separate sheet, if more space is needed.

The PARAMETERS section on the worksheet provides a column for the parameter number and a column for the parameter. A parameter consists of a maximum of four decimal digits.

The worksheet in Figure A-8 contains a brief sample program that repeatedly sends a message over the data communications interface. Note that the program steps are written as if displayed on the 834 front panel. A colon follows the SEND program step and an arrow follows the JUMP program step. The colon means that the cross-reference number (in this case, one) refers to a message. The arrow means that the cross-reference number (also one in the example) refers to a program step. A cross hatch (#) after a program step (not shown in the example) means that the cross-reference number refers to a parameter.

To conserve space, the message column of the sample worksheet contains only a short description (ASCII FOX MESSAGE) of the standard communicators message THE QUICK BROWN FOX JUMPS OVER A LAZY DOG. 0123456789 [CR] [LF]. The message is to be translated into ASCII hexadecimal code.

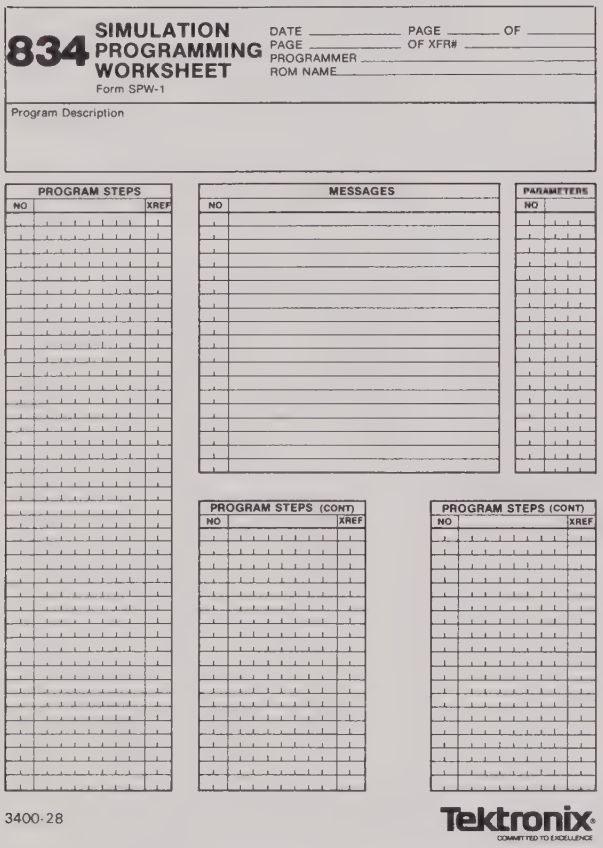


Figure A-7. The Simulation Programming Worksheet.

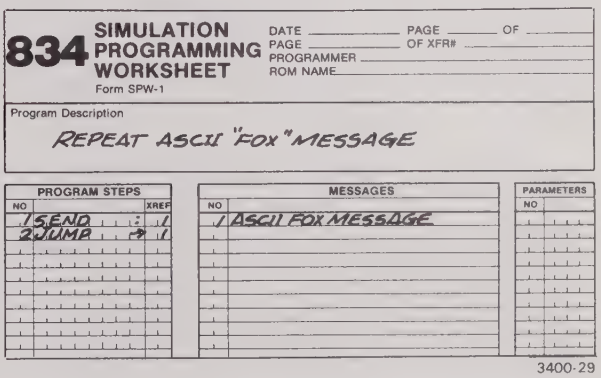


Figure A-8. A sample Simulation Programming Worksheet.

The Second Step: Coding the ROM List Entries

The second step of the custom XROM procedure involves coding the setup information and simulation programs of an 834 application into key sequence entries. In addition, all menu and directory entries needed for the applicaton are coded during this step.

Coding Key Sequence Entries

The Key Sequence Entry Format. The format of a key sequence entry is shown in Figure A-9. Byte 0 of the key sequence entry contains the entry number, either 01h or 02h. If the entry number is 01h, the key sequence entry is called automatically at power-up: all key codes in the entry are executed by the 834 when the instrument is switched on.

If the entry number is 02h, the key sequence entry can be called out by its transfer number. In this case, the key codes in the entry are executed only after typing the key sequence transfer number on the 834's front panel and then pressing the TRANSFER key.

The second and third bytes of a key sequence entry contain the length of the entry in bytes, the least significant byte of the length in byte 1 and the most significant byte of the length in byte 2. The length of a key sequence entry can vary from a minimum of seven bytes (an entry that contains only one key code) to an entry as large as the entire XROM (except for the space occupied by the custom XROM header and trailer).

Bytes 3 and 4 contain the key sequence entry transfer number. The transfer numbers in a user-generated, custom XROM always consist of three hexadecimal digits. When you type a key sequence entry transfer number on the 834's front panel and press the TRANSFER key, the 834 executes all the key codes in the entry in the order that the codes are listed in the entry. The effect is the same as pressing the corresponding keys sequentially on the front panel.

NOTE

Power up key sequences are executed in the order they are coded. If there are power up key sequences for CODE, BAUD, SETUP, etc. that are not in conflict, they will all be in effect at power up. If there are power up key sequences that are in conflict, the last one will be in effect. For example, if the power up key sequence is CODE=ASCII and CODE=HEX, the 834 will execute the CODE=ASCII key sequence and then execute CODE=HEX. But CODE=HEX, the final key sequence, is the one that will remain in effect.

The least significant byte of the transfer number is entered in byte 3 of a key sequence entry and the most significant byte of the transfer number is entered in byte 4. A transfer number of 123h, for example, is entered in the 0 key sequence entry as follows:

BYTE #	
3	23
4	01

Note that since a transfer number consists of three hexadecimal digits, the first hexadecimal digit in byte 4 (the most significant digit of the transfer number) is always 0.

The sequence of key codes begins in byte 5 of the entry. Table A-1 lists each key with its function and hexadecimal code. Each key code is one byte in length. The codes 0h through 1Ch, 1Fh, and 20h correspond to keys on the 834's front panel and are explained in earlier sections of this manual. The codes 21h through 25h correspond to the settings of the operating mode switch on the 834's front panel. These key codes set the operating mode internally and do not physically move the setting of the mode switch. The operating mode key codes are used only during the setup procedure to select menu entries specific to each mode. Before running an application, however, the operator must physically set the switch on the front panel to the desired mode.

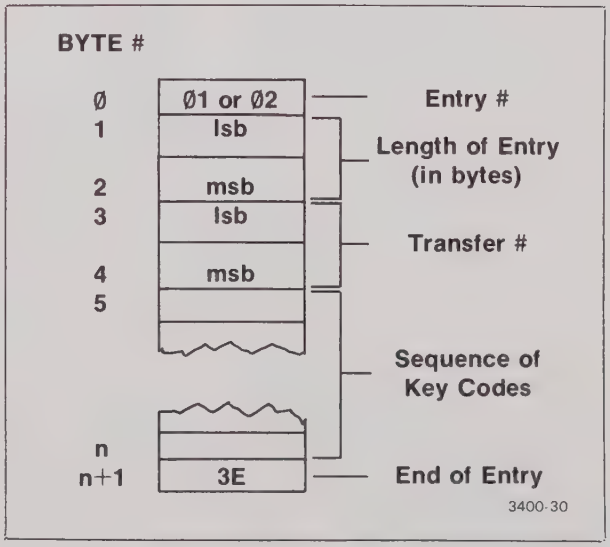


Figure A-9. The key sequence entry format.

Table A-1
834 FRONT PANEL KEY CODES

HEX CODE	NAME	CORRESPONDING KEY OR FUNCTION
Ø	Ø	Ø key
1	1	1 key
2	2	2 key
3	3	3 key
4	4	4 key
5	5	5 key
6	6	6 key
7	7	7 key
8	8	8 key
9	9	9 key
A	A	A key
B	B	B key
C	C	C key
D	D	D key
E	E	E key
F	F	F key
1Ø	ENTER	ENTER KEY
11	TRANSFER	TRANSFER KEY
12	CLEAR	CLEAR KEY
13	SEARCH	SEARCH KEY
14	BCC AT LOC	BCC AT LOC KEY
15	LEFT	← key
16	RIGHT	→ key
17	UP	↑ key
18	DOWN	↓ key
19	SETUP	SETUP KEY
1A	PROG	PROGRAM KEY
1B	DATA	DATA KEY
1C	X	X key
1D	EXIT ROM	Stop and Leave Display alone
1E	READY	Stops the 834 and displays the message "834 READY"
1F	START	START key
2Ø	STOP	STOP key
21	MONITOR	Monitor mode
22	DTESIM	DTE Simulation mode
23	DCESIM	DCE Simulation mode
24	BERT	BERT/BLERT mode
25	SELFTEST	SELFTEST mode
2A	DEL.BEFORE	Deletes all characters preceeding and including those currently displayed
2B	DEL. AFTER	Deletes all characters after those currently displayed
3D	NOKEY	Indicates no key pressed
3E	NULL	Terminates a key sequence entry; NULL function

For example, the key code 23h, internally sets the 834 to DCE Simulation mode. The succeeding key codes in the entry can then be used to select the setup options for DCE Simulation mode despite the physical setting of the operating mode switch on the front panel. To run a simulation program in DCE Simulation mode, though, the operator must rotate the front panel switch to the correct setting. (The internally set mode is automatically returned to the front panel setting when the START key is pressed or when the front panel input is again accepted after a key sequence entry is executed.)

The remaining key codes are an internal function and do not correspond to any particular key or switch on the 834's front panel. These internal functions are DEL BEFORE (2Ah), DEL AFTER (2Bh), NOKEY (3Oh), NULL (3Fh) and READY (1Eh).

The key code 2Ah (DEL BEFORE) deletes all characters that are currently displayed on the 834's front panel and all characters that precede the currently displayed characters. The DEL BEFORE function is also available through the 834's front panel by pressing 1, 0 and TRANSFER key.

The key code 2Bh (DEL AFTER) deletes all characters that follow the characters currently displayed on the 834's front panel. The DEL AFTER function is also available through the 834's front panel by pressing 1, 1, and TRANSFER.

The key code 3Dh (NOKEY) indicating that no key was pressed, does not generate an internal 834 function. This key code generally serves as a placeholder to reserve bytes in a key sequence entry for later use. It can also be used to delete key codes in a key sequence entry by overwriting the old codes.

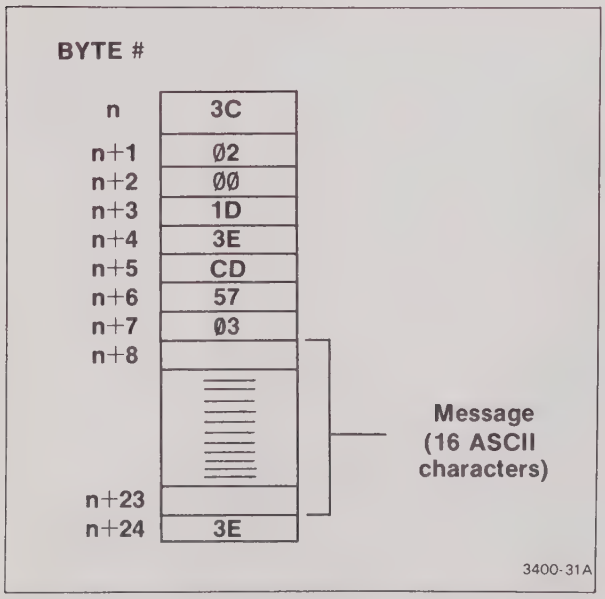


Figure A-10. The format for displaying a user-defined message at the end of a key sequence entry.

The key code 3Eh (NULL) terminates a key sequence (see Figure A-9). The last byte of all key sequence entries must contain the 3Eh code.

After the 834 executes all the key codes in a key sequence entry, the instrument is again ready to accept input from the front panel. The key code 1Eh (READY) is generally used to indicate the end of a key sequence entry to the operator by displaying the message 834 READY on the front panel. After receiving this message, the operator can resume pressing keys on the front panel to enter the 1Eh code in the byte preceding the last byte in the key sequence entry. The last two bytes of the entry should contain the following codes:

1E
3E

Instead of the message 834 READY, you can display your own message on the front panel to indicate the end of a key sequence entry. As shown in Figure A-10, the codes for displaying a user-defined message occupy the last 25 bytes of the entry. The first eight bytes contain the codes 3Ch, 02h, 00h, 1Dh, 3Eh, CDh, 57h, and 03h. The next 16 bytes contain your message, translated into ASCII hexadecimal code. If there are less than 16 characters in the message, pad the remaining bytes with spaces. (In ASCII code, the space character is 20h.) The last byte in the key sequence entry contains the 3Eh code.

The Key Sequence Entry Coding Form. All the setup information and simulation programs of an 834 application are coded into key sequence entries. The key sequence entry coding form in Figure A-11 provides columns in which to list sequence of keys and their corresponding codes. At the top of the form, you can circle the desired entry number: 01h if the key sequence entry is to be automatically called at power-up or 02h if

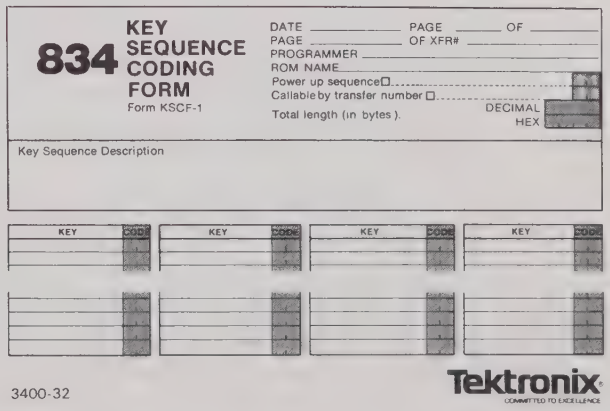


Figure A-11. The Key Sequence Coding Form.

the entry is to be called only by its transfer number. There is also space at the top to mark the entry's length and transfer number. For your convenience, a box is available on the form to mark the entry length in decimal notation. The length must be entered in the XROM, however, in hexadecimal notation.

To code the applications setup information into a key sequence entry, it is recommended you first select the desired options on the 834's front panel. Refer to the Setup Worksheets on any similar notes you used in the first step of the XROM coding procedure. As you press the keys needed to select the setup options, list the name of each key in order on the key sequence entry coding forms. For example, to select the setup option of ASCII code on the 834' front panel, you first press the SETUP key, then press the RIGHT key until "CODE=ASCII" is displayed. For the custom XROM, however, it is recommended that you first enter the 0 and RIGHT key before selecting from a circular list of setup options, pressing the 0 and RIGHT keys position the menu to the beginning of the list.

The option you want to select, then, is always an absolute offset from the beginning of the list. In the example, ASCII is the third entry in the list of code options. So, pressing the 0 and RIGHT keys, then pressing the RIGHT key twice will always display "CODE=ASCII" on the front panel and select the ASCII option. The keys to select the ASCII option are entered on the key sequence entry coding form as follows:

KEY	CODE
SETUP	
0	
RIGHT	
2	
RIGHT	

NOTE

When coding the key entry sequences remember that under some conditions (power up and menu expansion) the 834 may not be at its normal power up defaults. When coding a customized ROM be sure to take this into account.

Then, referring to Table A-1, enter the corresponding code for each key on the form in the column labeled "CODE". The key sequence coding form now contains the following:

KEY	CODE
SETUP	19
0	00
RIGHT	16
2	02
RIGHT	16

Coding a simulation program into a key sequence entry is similar to the method for coding setup information. For example, the following simulation program and the ASCII message ABC over the data communications network.

PROGRAM STEPS		NO. AND MESSAGE
NO.	X-REF	
1 SEND	1	1 ABC

To enter the program on the 834's front panel, you first press the PROGRAM key, then the CLEAR key to clear all previous program steps. Now press the DOWN and RIGHT keys to select SEND as the first program step and press the 1 and ENTER keys to enter 1 as the cross-reference number. The key sequence coding form, then contains the following:

KEY	CODE
PROG	1A
CLEAR	12
DOWN	18
RIGHT	16
1	01
ENTER	10

To enter the program message, press the PROGRAM and RIGHT keys, then press the CLEAR key to clear all previous messages. Now, after pressing the DOWN key, enter the message ABC on the front panel in ASCII hexadecimal code: to enter "A", press the 4,1, and ENTER keys; press the 4,2, and ENTER keys to enter "B"; and, press the 4,3, and ENTER keys to enter "C." After entering the corresponding codes for each key, the key sequence entry form now contain the following:

KEY	CODE
PROG	1A
CLEAR	12
DOWN	18
RIGHT	16
1	01
ENTER	10
PROG	1A
RIGHT	16
CLEAR	12
DOWN	18
4	04
1	01
ENTER	10
4	04
2	02
ENTER	10
4	04
3	03
ENTER	10

Character String Entries. Note that in the preceding example, each character in the program message occupies three bytes in the key sequence entry. Longer messages are more efficiently stored in a special kind of key sequence entry called a character string entry.

In a character string entry, each character of the message occupies only one byte. Figure A-12 shows the format of a character string entry.

Byte 0, the entry number, always contains 02. Bytes 1 and 2 contain the length of the entire character string entry. To calculate the length, add nine to the number of characters stored in the entry. Bytes 3 and 4 contain the entry's transfer number. A character string entry's transfer number consists of three hexadecimal digits. The most significant digit of the transfer number is always 9. Byte 4, therefore, contains 09h and byte 3 contains the least significant byte (lsb) of the transfer number.

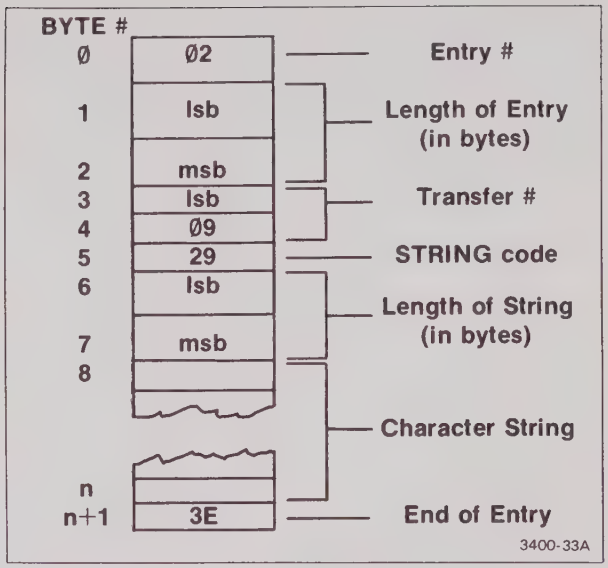


Figure A-12. The character string entry format.

Byte 5 of the character string entry always contains the code 29h. The next two bytes contain the length of the character string, the least significant byte of the length in byte 6 and the most significant byte of the length in byte 7. The character string length is the number of characters stored in bytes 8 through n of the entry, one character per byte. The last byte of the entry contains the code 3Eh.

The Character String Entry Coding Form in Figure A-13 provides space to mark the entry's transfer number total length and character string length (in both hexadecimal and, for your convenience, decimal notation). Write the alphanumeric characters in the string in the form's righthand column, one character in each small box. In the shaded box beneath each character, translate the character into the desired hexadecimal code (either ASCII, EBCDIC, or a user-defined translation code).

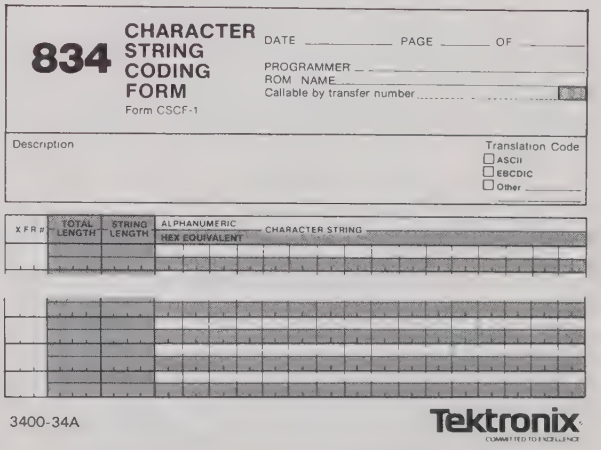


Figure A-13. The Character String Entry Form.

Figure A-14 shows a sample character string entry coding form that contains the ASCII program message ABCD 123 [CR] [LF]. The character strings length is 10 bytes and, adding 9 to the string length, the total length of the character string entry is 19 bytes. The entry's transfer number is 911. Usually, if a string is used more than once you should code it as a character string entry; if it is more than 7 characters, code it as a character string entry; but, if it is less than 7 characters code it into a key entry.

Nesting Key Sequence Entries. Calling another key sequence entry (or character string entry) within a key sequence entry is called nesting entries. After the first key sequence entry calls a second entry (the nested entry) the 834 begins executing the key codes in the nested entry. When the 834 has executed all the key codes in the nested entry, it resumes executing the remaining key code in the first entry. You can nest key sequence entries to a level of five deep.

A nested entry is called within a key sequence entry the same way you would call the entry on the 834's front panel by typing the nested entry's transfer number, then pressing the TRANSFER key. For example, if the nested entry's transfer number is 123h, enter the 1,2,3, and TRANSFER keys in the first entry.

Nesting entries is especially useful when a simulation program is stored in one main key sequence entry and the message for the program are stored in separate character string entries. In the key sequence entry that contains the simulation program, enter the character string entry transfer numbers where you would otherwise enter the program messages. For example, in the following key sequence entry section, a character string entry with the transfer number 911h is entered as the first message in a simulation program.

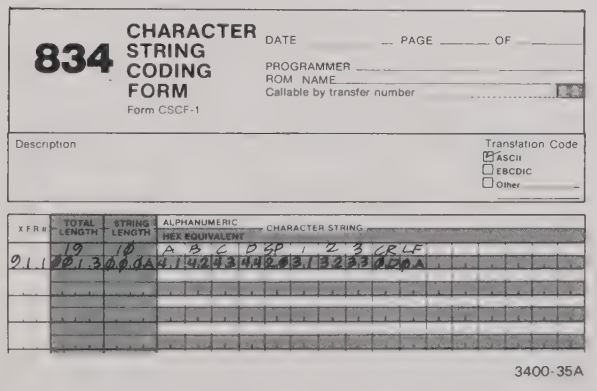


Figure A-14. A sample Character String Coding Form.

KEY	CODE
PROG	1A
RIGHT	16
CLEAR	12
DOWN	18
9	09
1	01
1	01
TRANSFER	11

The transfer number of a character string entry should always begin with a hexadecimal digit 9. This convention allows you to readily identify nested character string entries.

Coding Menu Entries

Menu entries allow you to add user-defined baud rates, idle definitions for sync and block async setups and translation codes to the existing setup menu options that are displayed on the 834's front panel. Unlike key sequence entries, menu entries do not have transfer numbers. The information stored in a menu entry is automatically available to the 834 power-up.

The setup option defined in a menu entry is added to the end of the circular list of options for the appropriate menu category. The user-defined setup option is not automatically selected. For example, if a baud rate of 2000 is defined in a menu entry, the option "2000" is added to the end of the list of standard baud rate options. Then, during the setup procedure, the operator can select a baud rate of 2000 by displaying BAUD=2000 on the front panel. You can select the baud rate of 2000 in a key sequence entry.

NOTE

Any name, set of symbols, or mnemonic can be displayed on the 834 as long as it uses 834 symbols and does not exceed 16 characters (the fluorescent display length).

User-Defined Baud Rates. Figure A-15 shows the menu entry format for a user-defined baud rate. Byte 0, the entry type always contains 21h. Bytes 1 and 2 always contain 0Eh and 00h, the length of the menu entry (14 bytes).

The next two bytes of the entry contain the baud rate divisor. The baud rate divisor is calculated by dividing 1,843,200 by the desired baud rate. For example, for a baud rate of 2000, the baud rate divisor is 922. (Round off the fractional amount to the nearest whole number. The amount lost or gained by rounding off the number will determine the accuracy of the baud rate.) Convert the decimal baud rate divisor to hexadecimal notation and enter the least significant byte of the divisor in byte 3 of the menu entry and the most significant byte of the divisor in byte 4.

Byte 5 of the menu entry, the flag byte, always contains 80h. Bytes 6 though 12 contain a string of seven ASCII characters. (The most significant bit of each character must be zero.) The characters are added to the circular list of baud rate setup options that are displayed on the 834's front panel. If the user-defined baud rate is 2000, for example, the string may contain the characters 2000. (You may also define any other character sequence for display.) If the string is less than seven characters, fill the remaining bytes with spaces. (The ASCII code for the SPACE character is 20h.) Byte 13, the last byte in the menu entry, always contains FFh.

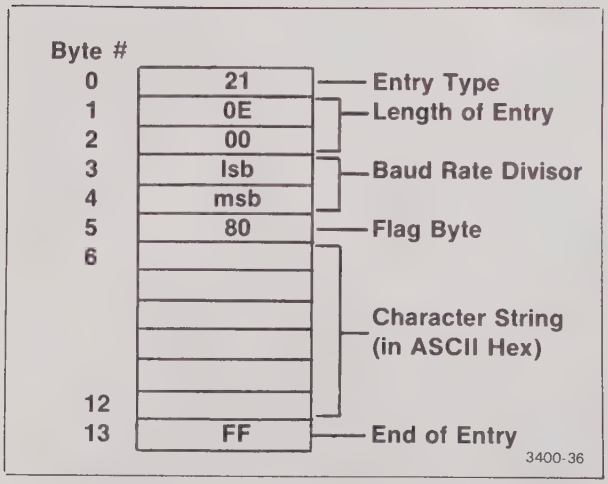


Figure A-15. Entry format for a user-defined baud rate.

The baud rate section of the menu entry coding form in Figure A-16 provides space to mark the baud rate divisor and character string. The bytes for the entry number, length, flag, and end of entry are already filled in on the form. The form also includes the formula for calculating the baud rate divisor.

Figure A-17 shows how to define a sample baud rate of 2000 on the menu entry coding form. The baud rate divisor is 922 in decimal notation which is converted to 039Ah in hexadecimal notation. The character string 2000 is translated into ASCII hexadecimal code. The three remaining bytes in the character string are filled with spaces. For easy reference, the baud rate of 2000 is marked in the space provided.

User-Defined Idle Definition. The user-defined sync idle characters apply only for a synchronous or block async setup and are added to the list of setup options displayed for the menu catgory IDLE=. Figure A-16 shows the menu entry format for user-defined sync idle characters. Byte 0, the entry number, always contains 2Dh. Bytes 1 and 2 always contain 0Eh and 00h, the length of the menu entry (14 bytes).

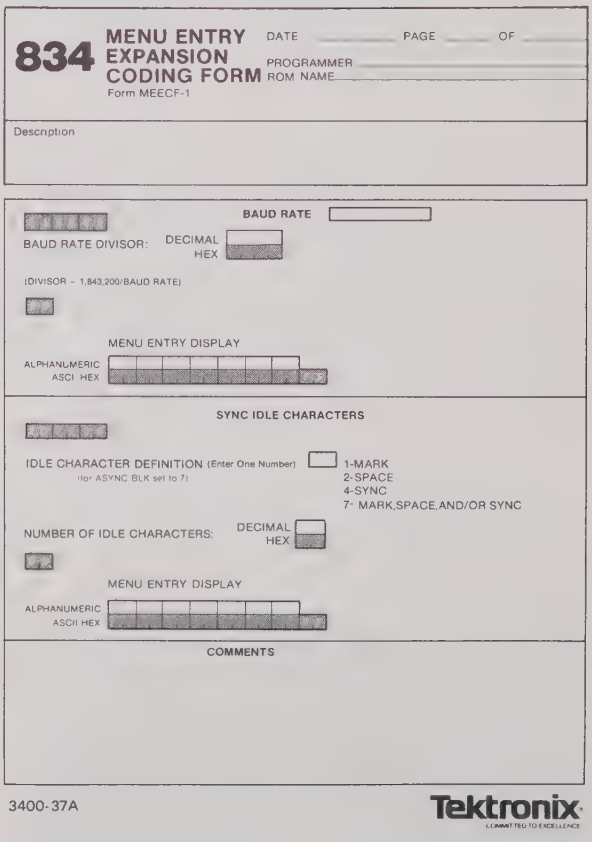


Figure A-16. The Menu Entry Coding Form.

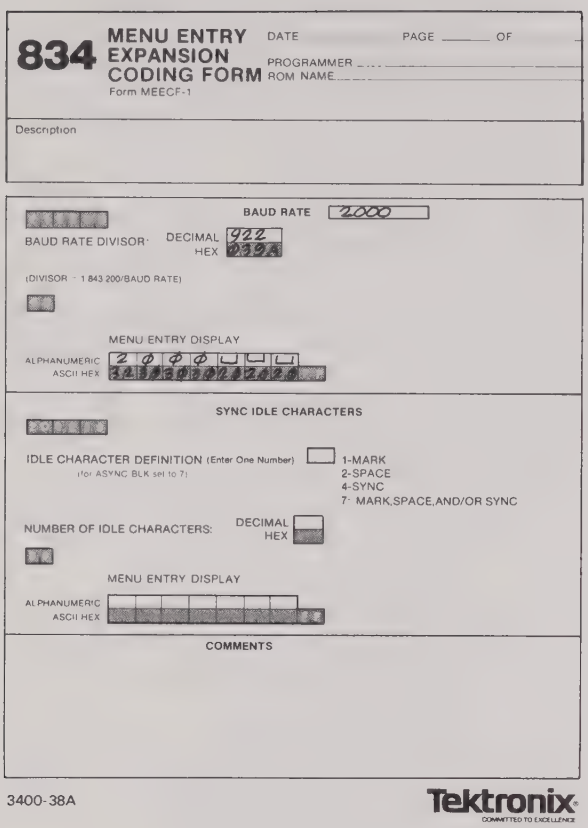


Figure A-17. Defining a sample baud rate of 2000 using the Menu Entry Coding Form.

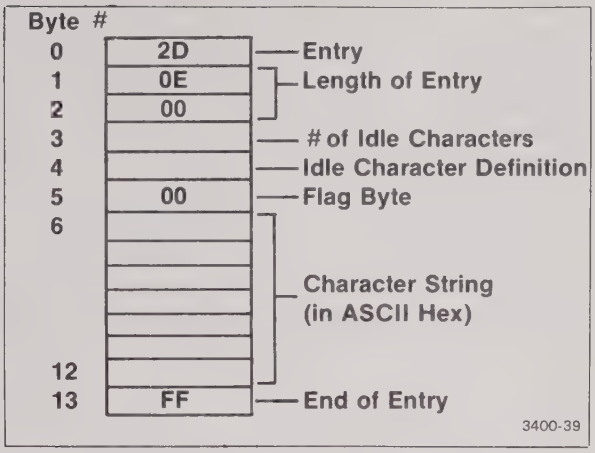


Figure A-18. The menu entry format for user-defined sync idle characters.

Byte 3 contains the number of characters in an idle condition. Byte 4 contains the idle character definition, either MARK, SPACE, SYNC, or all three. Use the following codes to select the idle character definition:

MARK - 01
SPACE - 02
SYNC 04
MARK, SPACE and/or SYNC - 07

Byte 5 of the menu entry, the flag byte, always contains 00h. Byte 6 though 12 contain a string of seven ASCII characters. The characters are added to the circular list of idle setup options that are displayed on the 834's front panel. If the string is less than seven characters, fill the remaining bytes with spaces. (The ASCII code for the SPACE character is 20h.) Byte 13, the last byte in the menu entry, always contains FFh.

The sync idle characters section of the menu entry coding form in Figure A-16 provides space to mark the number of idle characters, the idle character definition, and the character string. The bytes for the entry number, length, flag, and end of entry are already filled in on the form.

User-Defined Translation Codes

NOTE

Only the ROx series of ROM Packs are capable of handling translation tables.

There are two types of user-defined translation codes: standard codes and shifted codes. For the standard code, each hexadecimal value corresponds to one displayable character. For the shifted code, each hexadecimal value corresponds to two displayable characters: an unshifted character and a shifted character. The character displayed for a specific hexadecimal value depends on whether the unshifted or shifted characters are in effect.

Figure A-19A shows the menu entry format for a user-defined standard translation code. Bytes 0, 3, 4, 5, 13, 14, 15, and 16 always contain, respectively, the following hexadecimal values: (Byte 3 allows you to select a hex decode, code 00h, or a mnemonic decode, code 80h.) 20h, 00h, 00h, 80h, FFh, CDh, 1Dh, and 80h. Bytes 1 and 2 contain the length of the menu entry, the least significant byte of the length in byte 1 and the most significant byte of the length in byte 2. To calculate the length, add 18 to the number of characters in the entry's translation table. For example, if the translation table contains 64 characters, the length of the menu entry is 82 bytes (52h).

Bytes 6 through 12 of the menu entry contain a string of seven ASCII characters. The characters are added to the circular list of translation code setup options that are displayed on the 834's front panel. If the user-defined translation code is 6-bit transcode code, for example, the string might contain the characters, TRANSCO. If the string is less than seven characters, pad the remaining bytes with spaces. (The ASCII code for the SPACE character is 20h.)

Byte 17 of the menu entry contains a mark that identifies the number of data bits in each character, not including the parity bit. Use the following codes to select the data bits per character mark:

8 bits/character - FFh
7 bits/character - 7Fh
6 bits/character - 3Fh
5 bits/character - 1Fh

The translation code table starts in byte 18 of the entry. The length of the table is determined by the number of data bits per character.

8 bits/character - 256 bytes
7 bits/character - 128 bytes
6 bits/character - 64 bytes
5 bits/character - 32 bytes

Figure A-19B shows the menu entry format for a user-defined shifted translation code. Bytes 0, 3, 4, 5, 13, 14, 15, and 16 always contains, respectively, the following hexadecimal values: 20h, 00h, 00, 80h, FFh, CDh, 1Ah, and 80h. (Byte 3 allows you to select a hex decode, code 00h, or a mnemonic decode, code 80h.) Bytes 1 and 2 contain the length of the menu entry, the least significant byte of the length in byte 1 and the most

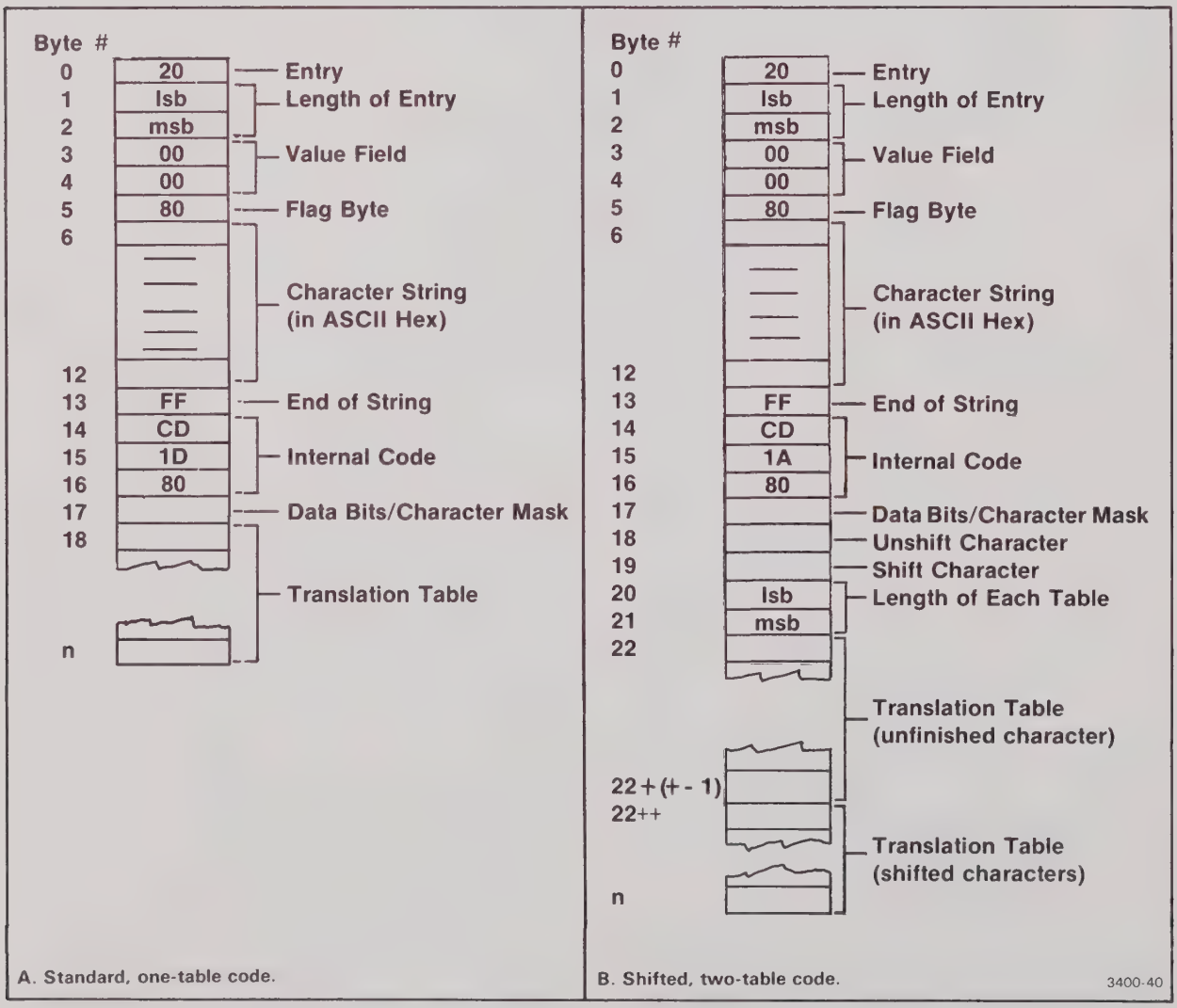


Figure A-19. The menu entry format for a user-defined translation code.

significant byte of the length in byte 2. To calculate the length, add 22 to the number of characters in the entry's two translation tables. For example, if each translation table contains 64 characters, the length of the menu entry is 150 bytes (96h).

Bytes 6 through 12 of the menu entry contain a string of seven ASCII characters. The characters are added to the circular list of translation code setup options that are displayed on the 834's front panel. If the string is less than seven characters, fill the remaining bytes with spaces. (The ASCII code for the SPACE character is 20h.)

Byte 17 of the menu entry contains a mask that identifies the number of data bits in each character, not including the parity bit. Use the following codes to select the data bits per character mark:

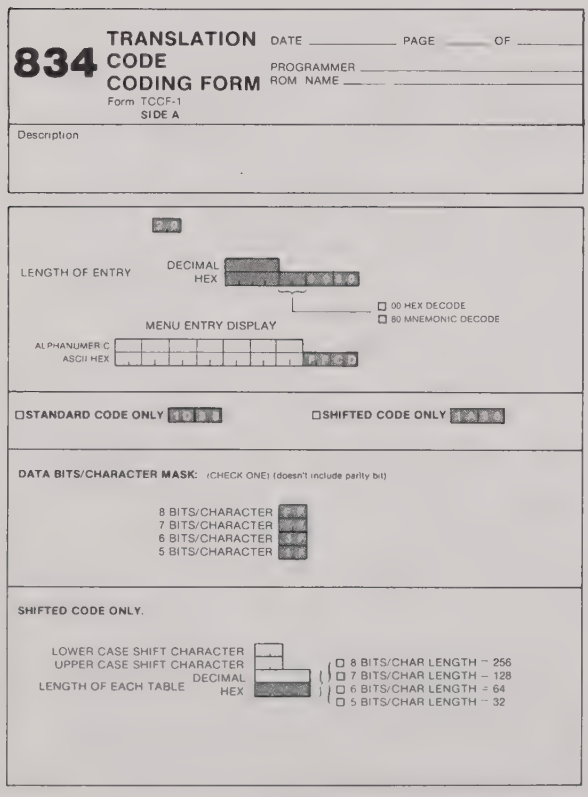
8 bits/character - FFh
7 bits/character - 7Fh
6 bits/character - 3Fh
5 bits/character - 1Fh

Byte 18 contains the unshift character. After receiving the unshift character, the 834 interprets all succeeding hexadecimal values as corresponding to the table of unshifted characters. Byte 19 contains the shift character. After receiving the shift character, the 834 interprets all succeeding hexadecimal values as corresponding to the table of shifted characters. For Baudot code, for example, the unshift character has the hexadecimal value 1Fh and the shift character has the hexadecimal value 1Bh.

Bytes 20 and 21 contain the length of each translation table, the least significant byte of the length in byte 20 and the most significant byte of the length in byte 21. The length of each table is determined by the number of data bits per character.

8 bits/character - 256 bytes (100h)
7 bits/character - 128 bytes (80h)
6 bits/character - 64 bytes (40h)
5 bits/character - 32 bytes (20h)

The first translation code table, for the unshifted characters, starts in byte 22 of the menu entry. The second translation code table, for the shifted characters, follows the first table.



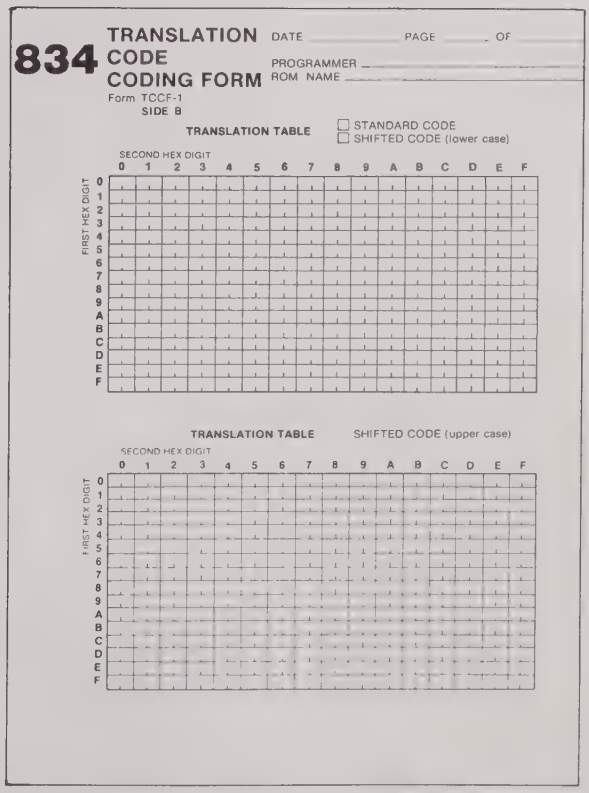


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Figure A-20. The menu entry coding form for defining a translation code.

The translation code section of the menu entry coding form in Figure A-20 provides space to mark the entry length, character string, and data bits/character mark for both standard and shifted translation codes. In addition, for shifted codes only, space is provided to mark the unshift character, the shift character, and table. The bytes of the menu entry which contain constant values (bytes 0, 3, 4, 5, 13, 14, 15, and 16) are already filled in on the form. For byte 3 you must make a selection of 00h (hex decode) or 80h (mnemonic decode).

The reverse side of the menu entry coding form provides two translation code tables, each table divided into boxes for a maximum of 256 characters. For a standard translation code, use only the first table. For a shifted translation code, use the first table for the unshifted characters and the second table for the shifted characters. When entering codes into a table, use the codes and symbols in Table A-2.

Coding Directory Entries

Directory entries offer a means to identify the individual key sequence entries in a custom XROM by displaying a brief description of each entry on the 834's front panel. For details on how to display the directory entry information, see an 834 ROM Pack manual.

The format of a directory entry is shown in Figure A-21. Byte 0, the entry number, always contains A2h. Bytes 1 and 2 always contain 14h and 00h, the length of the directory entry (20 bytes).

Bytes 3 through 18 of the directory entry contain a string of 16 ASCII characters. The characters are displayed on the 834's front panel. As a convention, it is recommended that bytes 3 through 5 contain the three-digit transfer number of the key sequence entry that is described in the directory entry. The 13-character description is entered in bytes 6 through 18.

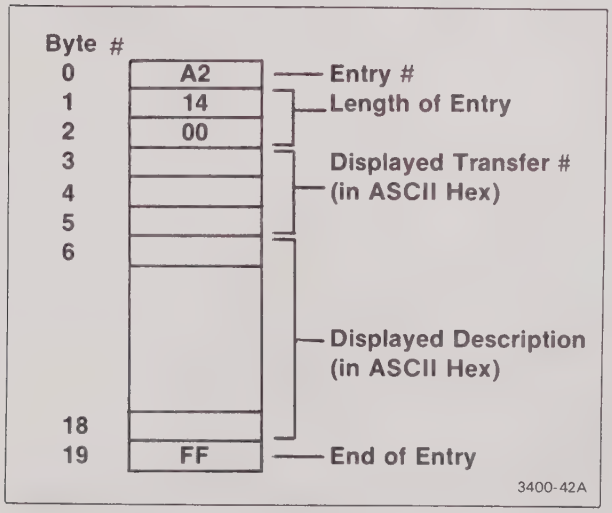


Figure A-21. The directory entry format.

If the string is less than 16 characters, fill the remaining bytes with spaces. (The ASCII code for the SPACE character is 20h.) Byte 19, the last byte in the directory entry, always contains FFh.

The directory entry coding form in Figure A-22 provides space to write the 16-character string. The bytes for the entry number, length, and end of entry are already filled in on the form.

Figure A-23 shows a sample directory entry that describes key sequence entry with the transfer number 211h. The key sequence entry contains a simulation program that sends the ASCII "Fox" message over an asynchronous data communications network. To describe the key sequence entry, the directory entry displays the character string 211 SEND ASYN FOX.

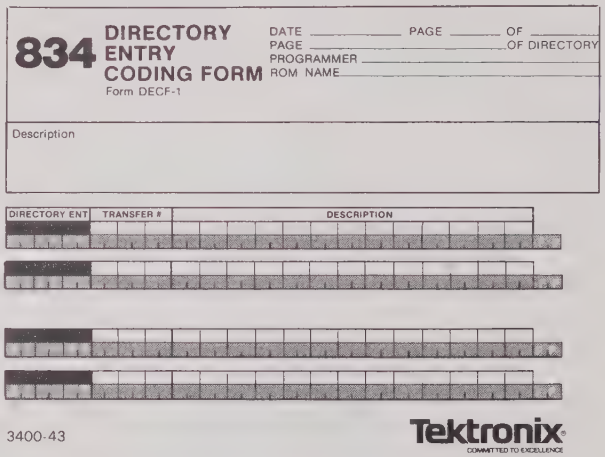


Figure A-22. The Directory Coding Form.

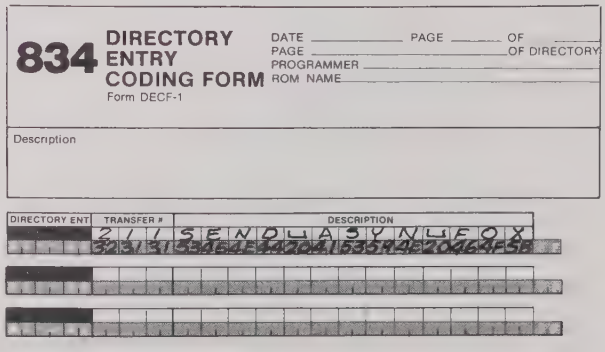
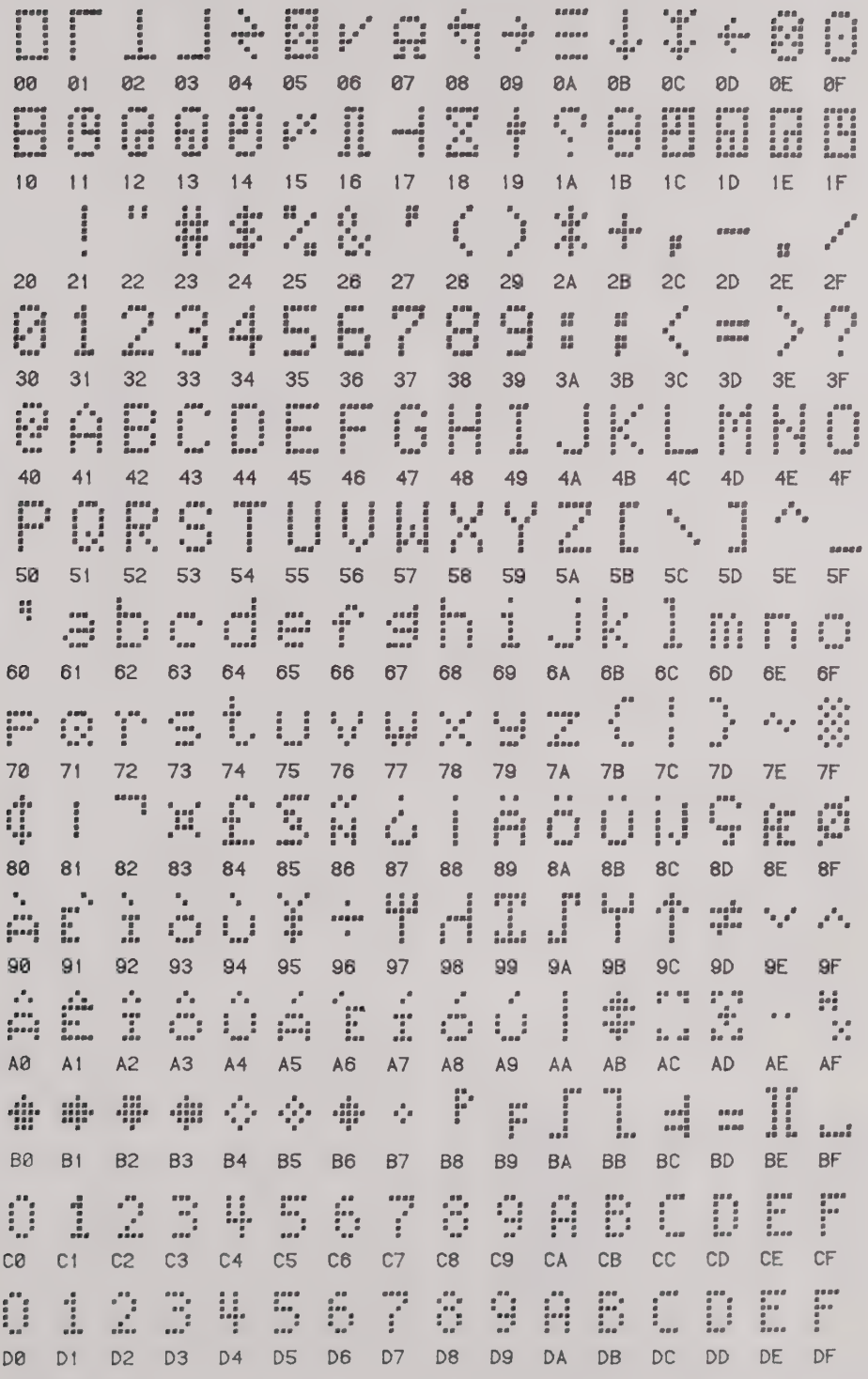


Figure A-23. A sample Directory Coding Form.

Table A-2
834 DISPLAY SYMBOLS



NOTE: Hex code indicates 834 code to create symbol.

The Third Step: The ROM Image

Creating the ROM image is the third and final step in the procedure for coding a custom XROM. The ROM's image consists of a sequential list of the hexadecimal values in each byte of the custom XROM. In the ROM image, first list all the bytes in the XROM header, then all the bytes in the ROM list entries, and, finally, all the bytes in the XROM trailer.

The formats of the header, ROM list entries and trailer have been described previously in this section. The third step of the coding procedure, is just a matter of listing all the information in the custom XROM in the correct order.

In bytes 0 through 31 of the ROM image, first code the XROM header. Then, starting at byte 32, list all the key sequence entries in the ROM list followed by the menu and directory entries. In the byte after the last byte of the last entry in the ROM list, enter the code FFh. The FFh code indicates the end of the ROM list. All bytes in the custom XROM between the end of the ROM list and the start of the trailer are ignored. Finally in the last six bytes of the ROM image, code the trailer. The ROM image used to generate the custom XROM.

Coding A Sample Custom XROM

To illustrate the entire custom XROM coding procedure, we'll code a brief sample custom XROM. In the example, we use the worksheets and coding forms provided in this section.

The First Step. We want to code a custom XROM that, plugged into the 834, will test an asynchronous ASCII terminal in a data communications network. To perform the test, we need a simulation program that repeatedly sends an ASCII message to the terminal.

In the first step of the custom XROM coding procedure, we select the setup options to be stored in the XROM (Figure A-24). The simulation program in Figure A-25 runs with the selected setup options in effect. Note the instruction to the 834 operator on the Setup Worksheet.

834 SETUP WORKSHEET
Form SW-1

DATE _____ PAGE 1 OF XROM
PAGE 1 OF XFR# 111
PROGRAMMER _____
ROM NAME _____

Description
SETUP FOR SEND ASCII "FOX" PROGRAM

SIMULATE/MONITOR MODE SETUP:

MODE: DCESIM
CODE = ASCII
BAUD
DUPLEX
DELAY
SETUP=ASYNC

SYNC	HDLC	ASYNC/ASYNBLK*
Bits/char	NRZI	Bits/Char = 8
Parity	Clock	Parity = NONE
BCC*		Stop Bits = 1
SYN		EOF = ØD
EOF		Timing
IDLE*		
Clock		

*BCC and IDLE in SYNC menu must be set with ASYNBLK

BERT MODE SETUP:

BAUD
PATTERN
BITS
SETUP

SYNC	ASYNC
Clock	Bits/Char
	Parity
	Stop Bits

TRIGGER PROGRAMS:

POS@
MATCH
T:
M:
ERROR
MARKER

OTHER SETUPS:
SET THE OPERATING MODE SWITCH TO DCE SIMULATION MODE.
KEY IN CORRECT BAUD RATE, DUPLEX, AND TIMING OPTIONS.
PRESS 2, 1, 1, AND TRANSFER KEYS.
PRESS START KEY.

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Figure A-24. Sample setup conditions.

834 SIMULATION PROGRAMMING WORKSHEET
Form SPW-1

DATE _____ PAGE 2 OF XROM
PAGE 1 OF XFR# 211
PROGRAMMER _____
ROM NAME _____

Program Description
SEND ASYNC ASCII "FOX" MESSAGE

PROGRAM STEPS NO		XREF
1	SEND 1	1
2	JUMP →	1

MESSAGES NO	
1	ASCII FOX MESSAGE

PARAMETERS NO	

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Figure A-25. A sample simulation program.

The Second Step. In the second step of the coding procedure, we code the options selected on the setup worksheet into a key sequence entry with the transfer number 111h (Figure A-26). At the top of the coding form, we select the entry number 02h (callable by transfer number) and write the length (29, or 1Dh, bytes).

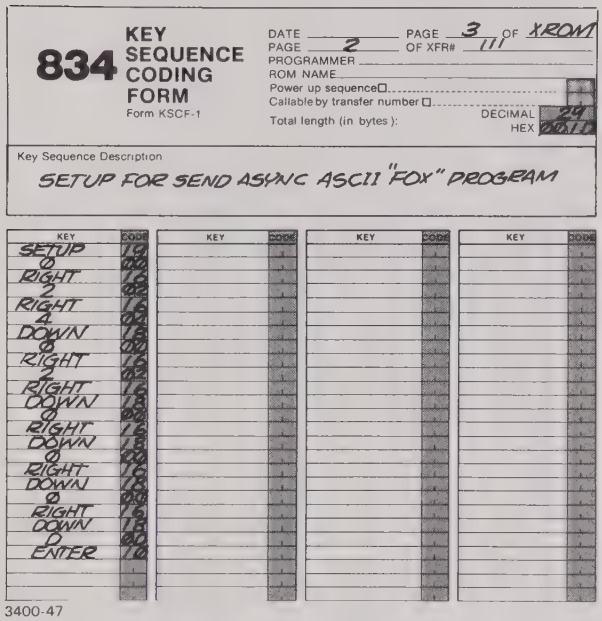

Figure A26. Coding the sample setup conditions into a key sequence entry using the Key Sequence Coding Form.

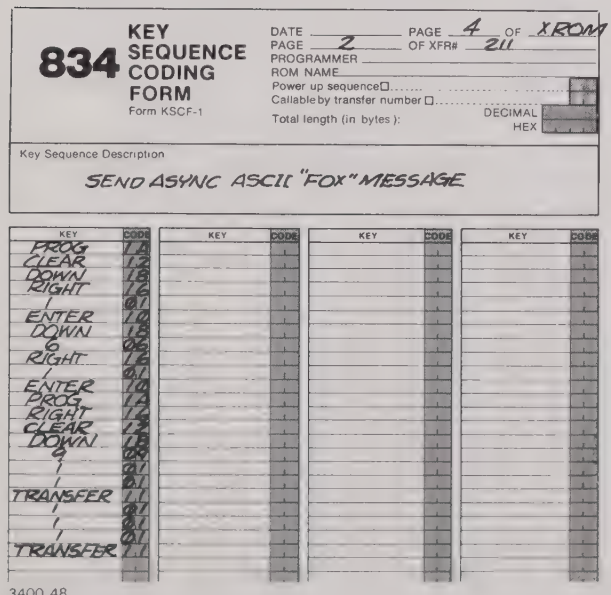

Figure A-27. Coding a sample simulation program into a key sequence entry using the Key Sequence Coding Form.

We then code the simulation program into a key sequence entry with the transfer number 211h (Figure A-27). The message for the program is coded separately in a character string entry with the transfer number 911h (Figure A-28). Note that both the transfer number for the key sequence entry that contains the setup options (111h) and the character string entry that contains the program message (911h) are nested in the key sequence entry that contains the simulation program. To run the program, then, the operator need only type one transfer number (211h) on the 834's front panel instead of typing three separate transfer numbers. (If the setups and messages are coded as separate entries, they can be used for other simulation programs.)

In addition to the key sequence and character string entries, we also code a menu entry that defines a baud rate of 2000 (Figure A-29). For the sample application, the operator may need to select a baud rate of 2000. The menu entry makes this baud rate available in the list of setup options displayed on the front panel.

We also code a directory entry (Figure A-30) that displays a brief description (211 SEND ASYN FOX) of the key sequence entry that contains the simulation program. This description is another convenience for the 834 operator.

The Third Step. In the third step of the procedure, we begin the ROM Image by coding the custom XROM header (Figure A-31). The header type is 55h which indicates that the header contains the XROM# length and the trailer contains a checksum. The XROM length must be an integral number of 256 byte pages. The XROM length is 2 K, or 2048, bytes (0800h bytes). The ASCII XROM ID is A SAMPLE XROM. In this example the reserved bytes in the header (bytes 20 through 31) contain FFh.

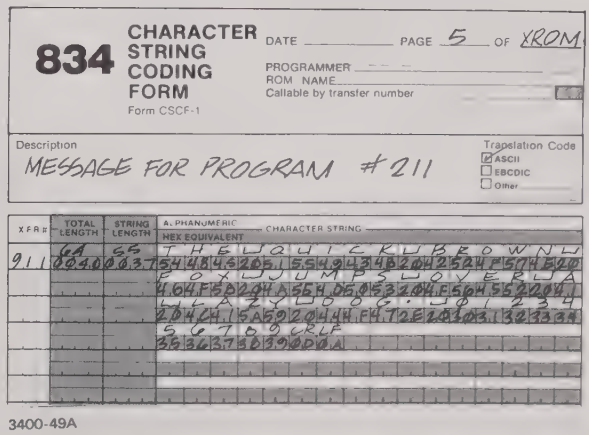

Figure A-28. Coding a message for a sample simulation program into a character string entry using the Character String Coding Form.

We next list the ROM list entries after the header in the ROM image (Figure A-32). The code FFh indicates the end of the ROM list entries. Finally, we complete the ROM image by coding the trailer in the last six bytes (Figure A-33). Together, Figures 31, 32, and 33 form the entire ROM image. The bytes between the end of the ROM list and the start of the XROM trailer are ignored by the 834. For the purpose of this example, we'll fill all these bytes with FFh.

Calculating the Checksum. The checksum is stored in the last two bytes of the custom XROM, the least significant byte of the checksum in byte END (the physical end of the XROM) and the most significant byte of the checksum in byte END-1.

To calculate the checksum, first load 0 into a 16-bit accumulator, then perform a rotate left on the result. Next, add the value in the first XROM byte above the checksum (END-2) to the value in the accumulator. Continue the procedure of rotating left and then adding the next byte in the XROM (above the preceding byte) to the value in the accumulator. The final byte (the first byte in the XROM) to the value in the accumulator, the calculation is complete. The resulting value is in the custom XROM checksum. Figure A-34 shows a Z80 subroutine that calculates the XROM checksum.

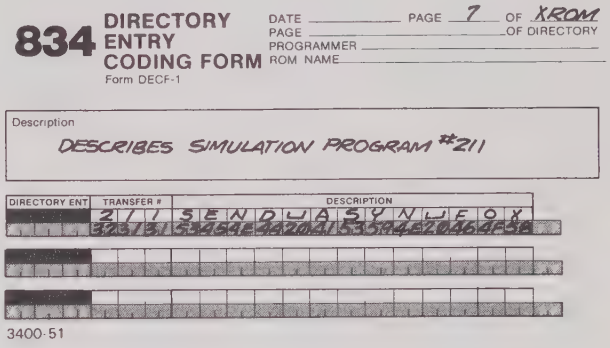

Figure A-30. Coding a directory entry to describe the key sequence entry with transfer number 21.

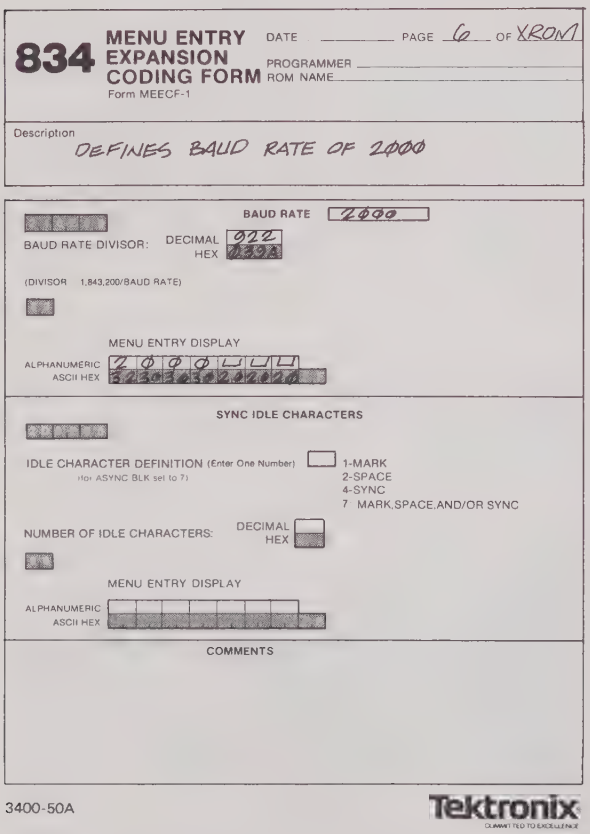

Figure A-29. Defining a sample baud rate of 2000 using the Menu Entry Expansion Coding Form.

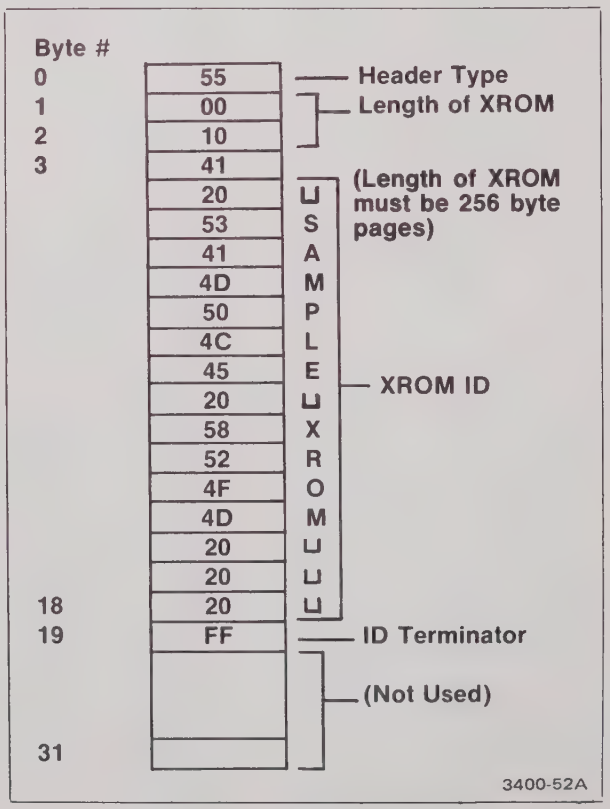

Figure A-31. A sample XROM header.

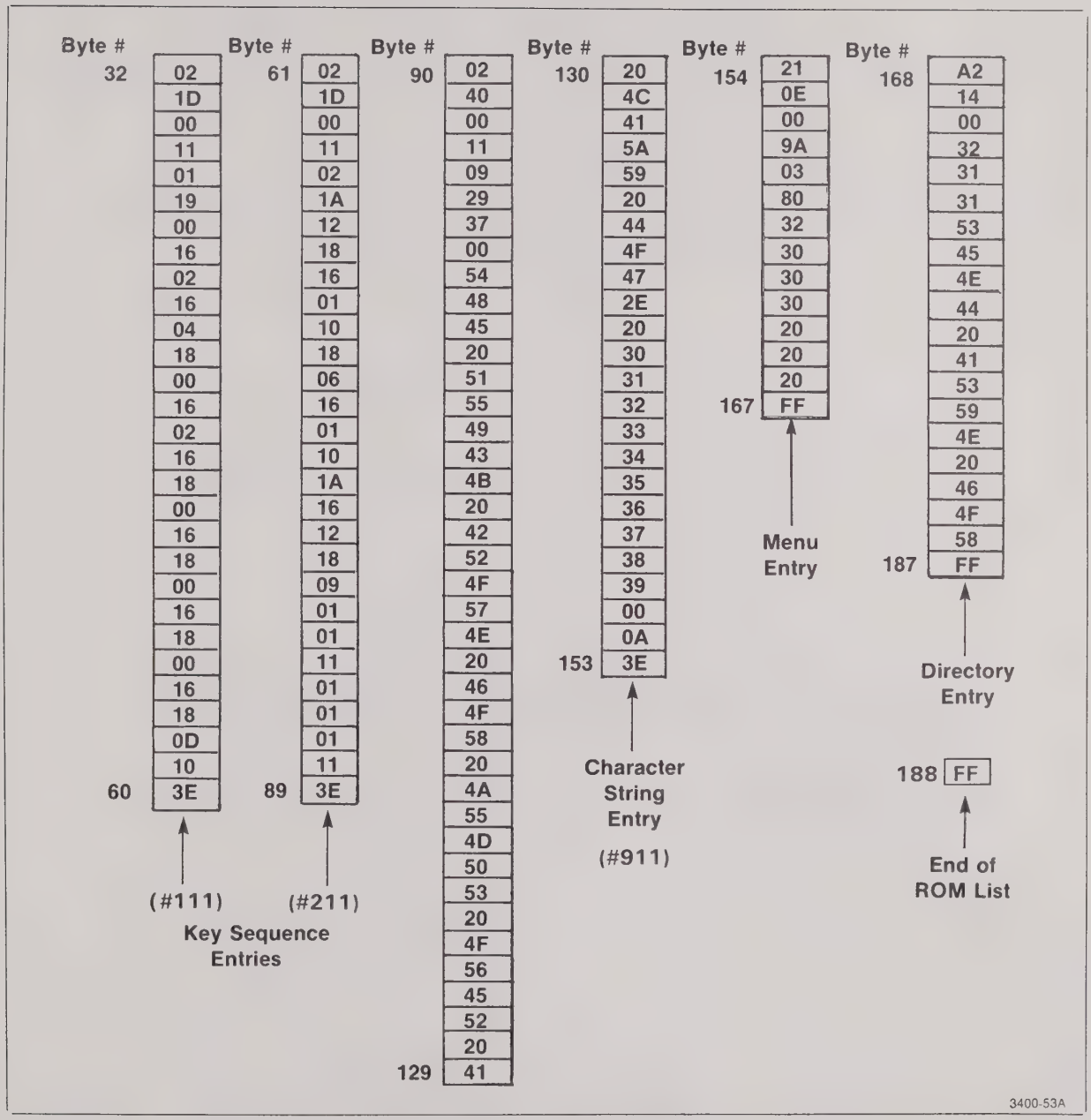

Figure A-32. A sample ROM list entry.

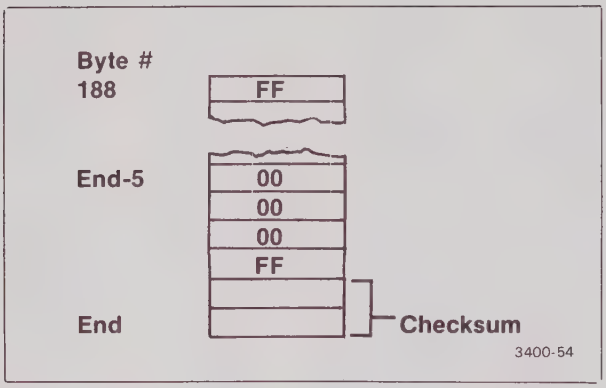

Figure A-33. A sample XROM trailer.

```
* ALOGORITHM: ROTATE LEFT WITH CARRY THE PREVIOUS RESULT (16 BITS WORTH)
* THEN ADD WITH CARRY THE NEXT ROM BYTE. DECREMENT ROM POINTER AND
* CONTINUE UNTIL BEGINNING OF ROM IS REACHED. (THE ROM POINTER STARTS
* AT ROM END -2 SO AS NOT TO INCLUDE THE CHECKSUM BYTES IN THE
* CALCULATION.)

* CHECKSUM ACCUMULATED IN DE, C SAVES HIGH BYTE OF ADDRESS FOR LATER USE.
* HL IS ROM POINTER. B IS HIGH BYTE OF (START OF ROM-1).

                LD      DE,0
                LD      H,C
                LD      L,$FD           HL NOW POINTS TO (CHECKSUM-1)
SHIFT.1         SLA     E               16-BIT LOGICAL LEFT SHIFT
                RL      D
                LD      A,E             ADD IN BYTE WITH CARRY
                ADC     A,(HL)
                LD      E,A
                JR      NC,NO.CARRY      WAS THERE CARRY?
                INC     D               ADD IT IN, IF SO.
NO.CARRY        DEC     HL               POINT TO NEXT BYTE
                LD      A,H
                CP      B
                JR      NZ,SHIFT.1      CONTINUE CALCULATION
```

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Figure A-34. Z-80 subroutine for calculating the XROM checksum.

834 SETUP WORKSHEET

Form SW-1

DATE _____ PAGE _____ OF _____
PAGE _____ OF XFR# _____
PROGRAMMER _____
ROM NAME _____

Description

SIMULATE/MONITOR MODE SETUP:

MODE: _____

CODE
BAUD
DUPLEX
DELAY

SETUP	SYNC	HDLC	ASYNC/ASYNBLK*
	Bits/char	NRZI	Bits/Char
	Parity	Clock	Parity
	BCC*		Stop Bits
	SYN		EOF
	EOF		Timing
	IDLE*		
	Clock		

*BCC and IDLE in SYNC menu must be set with ASYNBLK

BERT MODE SETUP:

BAUD
PATTERN
BITS

SETUP	SYNC	ASYNC
	Clock	Bits/Char
		Parity
		Stop Bits

TRIGGER PROGRAMS:

POS@
MATCH
T: _____
M: _____
ERROR
MARKER

OTHER SETUPS:

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834 SIMULATION PROGRAMMING WORKSHEET

Form SPW-1

DATE _____ PAGE _____ OF _____
PAGE _____ OF XFR# _____
PROGRAMMER _____
ROM NAME _____

Program Description

PROGRAM STEPS		
NO		XREF

MESSAGES	
NO	

PARAMETERS	
NO	

PROGRAM STEPS (CONT)		
NO		XREF

PROGRAM STEPS (CONT)		
NO		XREF

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834 KEY SEQUENCE CODING FORM

Form KSCF-1

DATE _____ PAGE _____ OF _____
PAGE _____ OF XFR# _____
PROGRAMMER _____
ROM NAME _____
Power up sequence ☐
Callable by transfer number ☐
Total length (in bytes): DECIMAL _____ HEX _____

Key Sequence Description

KEY	CODE

KEY	CODE

KEY	CODE

KEY	CODE

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834 MENU ENTRY EXPANSION CODING FORM

Form MEECF-1

DATE _____ PAGE _____ OF _____

PROGRAMMER _____

ROM NAME _____

Description

BAUD RATE

3,70E0,0

BAUD RATE DIVISOR: DECIMAL / HEX

(DIVISOR = 1,843,200/BAUD RATE)

5,0

MENU ENTRY DISPLAY

ALPHANUMERIC / ASCII HEX

FF

SYNC IDLE CHARACTERS

20,F0,0

IDLE CHARACTER DEFINITION (Enter One Number)
(for ASYNC/BLK set to 7)

1-MARK
2-SPACE
4-SYNC
7- MARK,SPACE,AND/OR SYNC

NUMBER OF IDLE CHARACTERS: DECIMAL / HEX

0,0

MENU ENTRY DISPLAY

ALPHANUMERIC / ASCII HEX

FF

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834 CHARACTER STRING CODING FORM

Form CSCF-1

DATE _____ PAGE _____ OF _____

PROGRAMMER _____

ROM NAME _____

Callable by transfer number _____ 0-2

Description

Translation Code
- ☐ ASCII
- ☐ EBCDIC
- ☐ Other _____

XFR #	TOTAL LENGTH	STRING LENGTH	ALPHANUMERIC CHARACTER STRING / HEX EQUIVALENT

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834 TRANSLATION CODE CODING FORM

DATE _____ PAGE _____ OF _____

PROGRAMMER _____

ROM NAME _____

Form TCCF-1

SIDE A

Description

2 0

LENGTH OF ENTRY: DECIMAL / HEX 0 0 8 0

☐ 00 HEX DECODE
☐ 80 MNEMONIC DECODE

MENU ENTRY DISPLAY

ALPHANUMERIC / ASCII HEX F F C D

☐ **STANDARD CODE ONLY** 1 D 8 0

☐ **SHIFTED CODE ONLY** 1 A 8 0

DATA BITS/CHARACTER MASK: (CHECK ONE) (doesn't include parity bit)

8 BITS/CHARACTER F F
7 BITS/CHARACTER 7 F
6 BITS/CHARACTER 3 F
5 BITS/CHARACTER 1 F

SHIFTED CODE ONLY:

LOWER CASE SHIFT CHARACTER:
UPPER CASE SHIFT CHARACTER:
LENGTH OF EACH TABLE DECIMAL / HEX

☐ 8 BITS/CHAR LENGTH = 256
☐ 7 BITS/CHAR LENGTH = 128
☐ 6 BITS/CHAR LENGTH = 64
☐ 5 BITS/CHAR LENGTH = 32

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834 TRANSLATION CODE CODING FORM

DATE _____ PAGE _____ OF _____

PROGRAMMER _____

ROM NAME _____

Form TCCF-1

SIDE B

TRANSLATION TABLE

☐ STANDARD CODE
☐ SHIFTED CODE (lower case)

FIRST HEX DIGIT \ SECOND HEX DIGIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1																
2																
3																
4																
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

TRANSLATION TABLE

SHIFTED CODE (upper case)

FIRST HEX DIGIT \ SECOND HEX DIGIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1																
2																
3																
4																
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

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834 DIRECTORY ENTRY CODING FORM

Form DECF-1

DATE _____ PAGE _____ OF _____
PAGE _____ OF DIRECTORY
PROGRAMMER _____
ROM NAME _____

Description

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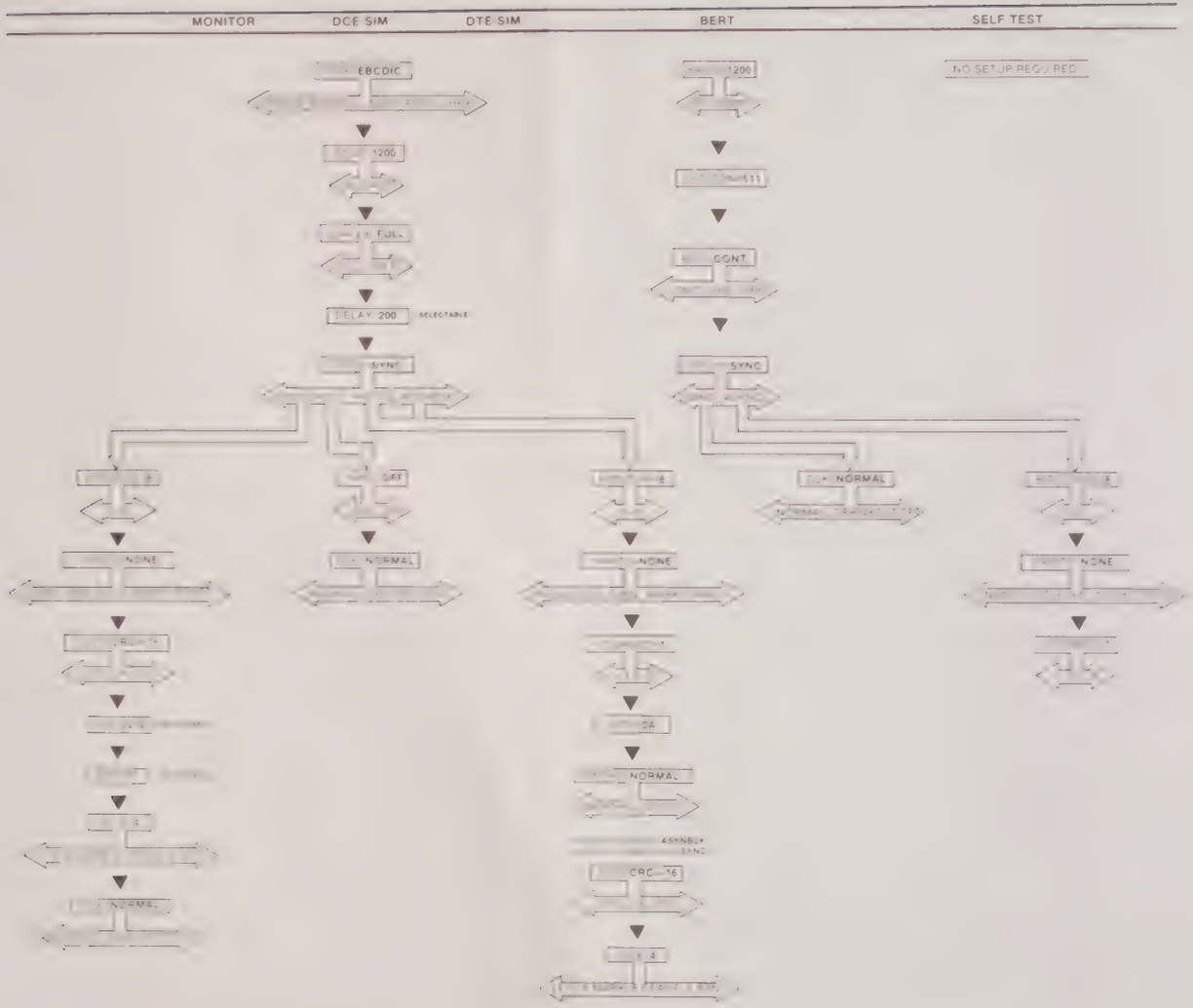
834 SETUP CHART



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